THE BIOPSYCHOSOCIAL IMPACTS OF NATURE BASED SOCIAL PRESCRIPTIONS ON HEALTH BEHAVIOURS OF INDIVIDUALS WITH, OR AT RISK OF DEVELOPING, NON-COMMUNICABLE DISEASES.

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A thesis submitted in partial fulfilment of the requirements of the University of Sunderland for the degree of Doctor of Philosophy

April 2026

Abstract

This research explores the role of nature-based interventions (NBIs) within social prescribing (SP) pathways as a means of preventing and managing non-communicable diseases (NCDs). While substantial evidence supports the physical, psychological, and social benefits of nature exposure, NBIs remain underutilised in public health strategies and SP referrals. This thesis addresses this gap by investigating the effectiveness, perceptions, barriers, and enablers associated with NBIs through SP. The primary aim is to understand how NBIs can be more systematically integrated into SP frameworks to support sustainable health behaviour change and holistic wellbeing, particularly in relation to lifestyle-driven NCDs. The thesis also seeks to inform the development of an evidence-based, theory-driven intervention that aligns with the biopsychosocial model of health.

The study employed a multi-phase mixed-methods design guided by the Intervention Mapping (IM) framework. First, an umbrella review synthesised evidence from 12 systematic reviews evaluating SP interventions targeting adults with or at risk of NCDs. The review assessed biopsychosocial and behavioural outcomes across nature-based and non-nature-based formats. Second, a qualitative needs assessment was conducted through semi-structured interviews and focus groups with both service users and stakeholders (e.g., social prescribers and community facilitators). Thematic analysis explored barriers to engagement, psychological readiness, and organisational constraints. Finally, a qualitative feasibility study was conducted to assess the acceptability and perceived practicality of a co-designed intervention package, including a promotional video, a nature needs assessment, a digital green space map, and an outcome tracking tool.

The umbrella review revealed that NBIs demonstrated greater improvements compared to non-nature-based interventions in reducing physiological stress markers (e.g., blood pressure, body fat), improving psychological wellbeing (e.g., reduced fatigue and anxiety), and fostering behavioural engagement (e.g., adherence to physical activity). However, NBIs were inconsistently implemented and rarely featured in routine SP pathways. The qualitative phase identified multi-layered barriers including time constraints, lack of confidence, digital exclusion, environmental access, and organisational role ambiguity. Participants highlighted the importance of familiarity, guided choice, social connection, and perceived legitimacy in determining engagement. The feasibility study confirmed the relevance and value of the proposed intervention components but underscored the need for systemic support, streamlined referral processes, and flexible delivery formats. Personalisation and practitioner endorsement were found to be particularly influential in increasing uptake and sustained participation.

This research demonstrates that NBIs offer distinctive and meaningful contributions to health promotion within SP pathways, particularly in supporting behaviour change across physiological, psychological, and social domains. Embedding NBIs into SP systems requires systemic support, practitioner training, inclusive co-design, and greater clarity around roles and expectations. The thesis contributes a theory-informed, stakeholder-driven intervention model with practical recommendations for policy and practice, including investment in green infrastructure, simplified referral mechanisms, and outcome tracking tailored to community settings. In doing so, it addresses not only what NBIs can offer but how a theoretically grounded, co-designed intervention can be developed, tested, and evaluated within SP pathways.

Contents

Dedication and Acknowledgements

First and foremost, I would like to express my deepest gratitude to my PhD supervisors, Dr. Stephanie Wilkie, Dr. Nicola Davinson, and Dr. Elizabeth Dent. Stephanie and Nicola, your patience, wisdom, and unwavering encouragement have guided me throughout this journey. I am deeply thankful for your thoughtful feedback, insightful suggestions, and the countless ways you have helped me stay on course. Elizabeth, thank you for joining the supervisory team in the later stages and for your invaluable insight, reassurance, and support during the final stretch. I would also like to thank Dr. Catherine Kenny and Dr. Jolel Miah for their valuable guidance and support at key stages of this research.

A special thanks to all the participants who gave their time to take part in this research. Your honesty, openness, and willingness to share your experiences made this work possible, and I am deeply grateful for your contributions.

To my PhD bestie, Lauren Bennett, I genuinely couldn’t have done this without you. Thank you for being there through the highs, lows, and everything in between; for the endless hours of company as we sat at our laptops; and for the constant reminders that we’d get through it somehow and that it would all be worth it. You made it all so much more enjoyable and a lot less lonely.

To my Mam, Dad, and the rest of my family, who may not have fully understood what I was doing but still supported me and never failed to let me know they were proud, your belief in me has meant so much. To my friends, colleagues, and clients, thank you for always cheering me on; your encouragement has meant the world.

To Matt, and our amazing kids, Dylan and Peyton, it’s finally done! Thank you for putting up with me through every late night, every moment of stress, and the many times when my mind was elsewhere. Your love, patience, and understanding have meant everything, and I couldn’t have done this without you. You are my whole world, and this achievement belongs to all of us.

And finally, to my dog Lexi, for the long walks in nature that kept me sane.

Tables and Figures

Abbreviations

ART – Attention Restoration Theory

BCIO - Behaviour Change Intervention Ontology

BCTTv1 - Behaviour Change Technique taxonomy

BCW – Behaviour Change Wheel

BPS – Biopsychosocial

COM-B – Capability, Opportunity, Motivation – Behaviour model

CRT –Conditioned Restoration Theory

CVD – Cardiovascular disease

ERNE – Emotion Regulation through Nature Engagement

ERT – Emotion Regulation Theory

GP – General Practitioner

HBM – Health Belief Model

IM – Intervention Mapping

LMIC – Low- and Middle-Income Countries

MDT – Multidisciplinary Team

MI – Motivational Interviewing

MRC – Medical Research Council

NBI – Nature-Based Intervention

NBSP – Nature-Based Social Prescription

NCD – Non-Communicable Disease

NHS – National Health Service

PCN – Primary Care Network

PHQ-9 – Patient Health Questionnaire-9

QoL – Quality of Life

rTA – Reflexive Thematic Analysis

SCT – Social Cognitive Theory

SDT – Self-Determination Theory

SP – Social Prescribing

SRT – Stress Reduction Theory

TDF – Theoretical Domains Framework

TTM – Transtheoretical Model of Change

VCSE – Voluntary, Community and Social Enterprise sector

WEMWBS – Warwick-Edinburgh Mental Wellbeing Scale

WHO – World Health Organisation

Chapter 1 Background and Literature Review

1.1 Introduction

Non-communicable diseases (NCDs) are among the most pressing health challenges of the 21st century (World Health Organisation [WHO], 2023). Despite being largely preventable, their prevalence continues to rise, driven by a complex interplay of behavioural, social, and environmental factors (Kelly & Barker, 2016). Traditional prevention strategies, grounded in biomedical models (Wade & Halligan, 2004) and public health messaging, have often proven insufficient to support sustainable behaviour change (Kelly & Barker, 2016). As a result, a more holistic understanding of health has gained traction, one that accounts for the biological, psychological, and social determinants of disease (Engel, 1977/2012; Seyed Alitabar, 2025). While conceptually robust, this biopsychosocial (BPS) model lacks practical guidance on how to foster behaviour change at scale (Bolton & Gillett, 2019; Xiao et al., 2021).

This chapter explores the role of nature and social prescribing (SP) in supporting health and behaviour change within this evolving context. It begins by examining the burden and preventability of NCDs, then outlines the theoretical underpinnings of holistic health models and behaviour change. It goes on to explore the health-promoting potential of natural environments and introduces nature-based interventions (NBIs) as a promising yet underutilised approach to NCD prevention. Crucially, it highlights that engagement with nature is not evenly distributed across populations, leading to questions about accessibility and inclusion. To address this, the chapter introduces SP as a scalable, theory-informed strategy to connect individuals with health-enabling environments, including nature. Finally, it establishes the rationale and direction of this thesis, which focuses on how NBIs can be more effectively embedded into SP pathways to support equitable behaviour change and reduce the burden of NCDs.

1.1.1 *Terminology and Scope*

Throughout this thesis, the terms NBIs and nature-based social prescribing (NBSPs) are used with related but distinct meanings. NBIs refer broadly to structured activities or programmes that intentionally use contact with nature to improve health and wellbeing (Shrestha et al., 2023). This includes interventions such as green exercise, community gardening, and therapeutic horticulture, regardless of whether they are accessed independently or through healthcare pathways. In this context, the term natural environment refers to outdoor green and blue spaces, such as parks, woodlands, rivers, and coastlines, as well as designed or semi-natural settings (e.g., community gardens or allotments) that enable restorative or health-promoting experiences (Twohig-Bennett & Jones, 2018). NBSPs, by contrast, denote the embedding of nature-based interventions within social prescribing systems, typically involving referrals or support from link workers, primary care teams, or other community connectors (De Bell et al., 2024). In this thesis, the term NBI is used primarily when discussing the intervention formats themselves and their biopsychosocial outcomes, while NBSP is used when analysing how such interventions are embedded within referral pathways, healthcare systems, and policy structures. This distinction ensures clarity between the mechanisms of action delivered by NBIs and the systems of delivery and legitimacy associated with NBSPs.

The thesis also makes frequent reference to SP more broadly, defined here as the process of connecting individuals to non-clinical, community-based forms of support to address health and wellbeing needs (Morse et al., 2022). SP typically involves a referral mechanism from healthcare practitioners and is often facilitated by link workers (sometimes called community connectors), who work with individuals to identify appropriate local opportunities. Many of these activities are delivered by the third sector or voluntary, community, and social enterprise (VCSE) sector, reflecting the importance of cross-sectoral collaboration in the delivery of SP and NBSPs.

Finally, two conceptual anchors run throughout this thesis. The BPS model of health (Engel, 1977; Wade & Halligan, 2017) provides the overarching framework, recognising that biological, psychological, and social factors interact to shape health outcomes and behaviour. The primary public health focus is NCDs, chronic conditions such as cardiovascular disease (CVD), type 2 diabetes, cancers, and depression, which share common modifiable risk factors including physical inactivity, obesity, stress, and social isolation (Murray et al., 2020; WHO, 2018). By situating NBIs and NBSPs within this model and health agenda, the thesis positions them as both individual-level supports and system-level strategies for addressing the global NCD burden.

1.2 Non-Communicable Diseases

Diseases are commonly categorised as either communicable or non-communicable, depending on their mode of transmission. Communicable diseases, such as tuberculosis, influenza, or HIV/AIDS, are caused by infectious agents and transmitted through human contact, airborne particles, or contaminated environments. In contrast, NCDs are not caused by infectious pathogens and are not directly transmissible between individuals (WHO, 2010). Instead, they are typically chronic conditions that develop over time and result from a complex interplay of genetic, behavioural, environmental, and social factors.

Despite this broad definition, there has been growing debate over the accuracy and utility of the term “non-communicable.” Scholars such as Sheldon and Wright (2020) and Frumkin and Haines (2019) argue that NCDs may, in fact, be socially and environmentally transmitted, influenced by social networks, urban design, cultural norms, and shared exposures. For example, living in an area with few parks or high pollution can increase health risks, even if the disease itself is not contagious. From this perspective, the boundary between communicable and NCDs begins to blur. Nonetheless, public health consensus continues to use the term to refer primarily to four major disease clusters: CVD, cancers, chronic respiratory diseases (e.g., COPD), and type 2 diabetes. These conditions collectively account for over 70% of all global deaths from NCDs and are associated with high levels of morbidity, disability, economic burden, and reduced quality of life (Hunter & Reddy, 2013; Islam et al., 2014; Tabish, 2017; Rai et al., 2020). Most are strongly influenced by modifiable behaviours and social determinants, meaning they are largely preventable or manageable through lifestyle and systemic interventions (Kelly & Barker, 2016).

In the modern era, NCDs are increasingly shaped by the characteristics of digital and urban lifestyles. Urbanisation brings exposure to air and noise pollution, limited access to green space, and a reduction in incidental physical activity. Simultaneously, widespread use of digital technologies contributes to more sedentary behaviour, disrupted sleep, and increased social isolation (Christensen et al., 2016; Exelmans & Van den Bulck, 2016; Twenge & Campbell, 2018; Meier et al., 2020). These conditions exacerbate the burden of NCDs by compounding behavioural and environmental risk factors. Understanding the implications of these contemporary lifestyle patterns is therefore essential to modern public health strategies. These same considerations have also prompted broader questions about the scope of what should be included under the NCD framework, particularly regarding the status of mental health conditions.

A further layer of complexity arises in discussions about whether mental health conditions should be subsumed under the NCD framework. Some researchers have argued for their inclusion, given that conditions such as depression and anxiety are chronic, non-infectious, and share common risk factors and biological pathways, such as stress, inflammation, and social disadvantage, with physical NCDs (Slavich & Irwin, 2014; Vigo, Thornicroft, & Atun, 2016). The biopsychosocial model (Engel, 1977; Wade & Halligan, 2004) supports an integrative view in which mental and physical health outcomes are intertwined and arise from overlapping systems.

While clinically diagnosed mental health conditions fall outside the primary focus of this thesis, mental health and psychological wellbeing are still recognised as important elements within its conceptual framework. Here, mental health is treated as a cross-cutting construct that both influences and is influenced by non-communicable disease (NCD) risk, health behaviours, and engagement with interventions. This position aligns with the biopsychosocial (BPS) model of health, which emphasises the dynamic interaction between biological, psychological, and social processes in shaping health outcomes (Engel, 1977; Wade & Halligan, 2017).

Psychological factors such as stress, emotional wellbeing, motivation, and perceived control are therefore considered central mechanisms within this research, particularly in relation to behaviour change and sustained engagement (Bandura, 2001; Kelly & Barker, 2016). Clinical mental illnesses (e.g., diagnosed depression or anxiety disorders) are excluded from the operational definition of NCDs adopted in this thesis to maintain conceptual clarity and methodological focus, reflecting ongoing distinctions within public health surveillance and policy frameworks (WHO, 2018; Vigo et al., 2016). Nonetheless, mental health and wellbeing are explicitly examined throughout the thesis as relevant determinants, mediators, and outcomes within the prevention and management of physical NCDs.

1.3 Biopsychosocial Model of Health

Historically, health has been predominantly understood and addressed through the biomedical model. This traditional approach focuses on biological causes, such as germs or genes, and treats illness with drugs or surgery, often viewing the body as separate from the mind (Rocca & Anjum, 2020). It assumes that disease is fully accounted for by measurable physiological dysfunction, treating the body like a machine and maintaining a reductionist, mind–body dualism (Rocca & Anjum, 2020). Rooted in the principles of scientific reductionism, this model conceptualises disease as a malfunction of biological systems and has contributed to significant advances in acute care, diagnostics, and pharmacological interventions (Wade & Halligan, 2004). Its success in controlling infectious diseases and performing life-saving procedures is undeniable. However, its limitations have become increasingly apparent, particularly in the context of NCDs, which are shaped by a complex interplay of biological, psychological, behavioural, and social factors (Borrell-Carrio, Suchman, & Epstein, 2004).

The biomedical model has been criticised for reducing patients to pathophysiological processes, often neglecting the subjective experience of illness and the wider determinants of health. It typically fails to account for factors such as chronic stress, emotional well-being, cultural context, and socioeconomic inequality, all of which are increasingly recognised as critical influences on both the onset and progression of long-term conditions (Engel, 1977; Deacon, 2013). As a result, it may offer effective symptom management without addressing the broader context of patients' lives.

With the global rise in NCDs, there has been a necessary and ongoing shift in the way health is approached. This shift involves bridging disciplines beyond medicine, incorporating insights from psychology, sociology, public health, and environmental studies. It has also generated increasing interest in how individuals perceive, interpret, and act upon their environments (Hartig, Mitchell, de Vries, & Frumkin, 2014). In this context, the BPS model has emerged as the most widely used interdisciplinary framework for understanding health and illness (Engel, 1977). It challenges the mind-body dualism of traditional biomedical thinking and proposes that biological, psychological, and social processes are fundamentally interconnected. For instance, a person with heart disease may be affected not only by genetic predisposition or cholesterol levels but also by stress, loneliness, or their physical and social environment (Xia & Li, 2018).

The BPS model integrates biological mechanisms such as genetics and physiology, psychological dimensions such as cognition, emotion, and behaviour, and social influences including family support, cultural norms, income, and education (Borrell-Carrio et al., 2004; Bolton & Gillett, 2019). This broader view enables more comprehensive patient care by acknowledging the full range of factors that affect health and well-being. Rather than discarding the biomedical model, the BPS framework expands upon it, promoting a more inclusive and contextualised understanding of health (Wade & Halligan, 2017).

Despite its conceptual appeal and growing uptake in clinical and policy contexts (Bolton & Gillett, 2019), the BPS model is not without limitations. A key critique is that while it identifies various contributing factors to illness, it provides limited practical direction for how to influence or change the behavioural patterns that underlie many chronic conditions (Ogden, 2016). For example, understanding that psychological stress and social isolation contribute to cardiovascular risk does not, in itself, offer clinicians or patients a clear method for initiating and sustaining behaviour change. This is particularly important in the management of NCDs, where long-term self-care, lifestyle modification, and prevention strategies are essential. Without clearer guidance on how to operationalise its insights into effective interventions, the BPS model risks being seen as broad in scope but lacking in actionable specificity. As such, it may struggle to fulfil its promise in addressing the growing global burden of lifestyle-related diseases.

1.4 NCD Risk and Protective Factors.

Risk factors for NCDs can be categorised into two groups: modifiable and non-modifiable. Modifiable risk factors are those that can be changed, and NCDs share a number of key behavioural ones, including smoking, unhealthy diet, lack of physical activity, and the harmful use of alcohol (Koyanagi et al., 2020). These behaviours contribute to intermediary physiological conditions such as obesity, hypertension, and dyslipidaemia, which are major drivers of disease development (Peters et al., 2019; Sheldon & Wright, 2020; WHO - Noncommunicable Diseases Progress Monitor, 2020). Many of these risk factors are shaped by environmental exposures, for example, air pollution contributes directly to respiratory and cardiovascular conditions, while broader cultural and societal conditions influence diet, physical activity, and substance use (Hunter & Redd, 2013).

These factors have a particularly severe impact in low- and middle-income countries (LMICs), where the burden of NCDs is rising rapidly (Islam et al., 2014). In LMICs, populations often face a triple challenge: a high prevalence of behavioural risk factors, limited access to healthcare for early detection and treatment, and constrained health system capacity to manage chronic disease (Checkley et al., 2014; WHO, 2025). These issues contribute to increased morbidity, premature mortality, and growing economic strain due to healthcare costs and lost productivity (Islam et al., 2014). For example, over three-quarters of global NCD-related deaths now occur in LMICs, with disproportionate effects on working-age adults, which further undermines economic development and social stability (NCD Alliance, 2024).

In addition to structural barriers such as inadequate healthcare infrastructure or limited public health investment, cultural and socioeconomic factors play a crucial role in determining access to health-promoting resources, including NBIs. Individuals from lower-income backgrounds or ethnically diverse communities may face barriers such as perceived or actual safety concerns in public green spaces, lack of time or financial resources, and differing cultural norms around outdoor activity and wellness (Jennings et al., 2016; Kabisch et al., 2017). These structural inequities intersect with cultural and environmental influences, shaping people's capacity to engage in protective behaviours. Addressing such inequities is essential for the inclusivity and effectiveness of public health strategies (Shanahan et al., 2015).

In understanding how access barriers and structural inequities influence health outcomes, it is also essential to consider the broader landscape of risk and protective factors associated with NCDs. Physical activity and a healthy diet have been consistently identified as the strongest protective factors against NCDs (Peters et al., 2019). These behaviours, however, do not occur in a vacuum; they are shaped by individual choices operating within wider social, cultural, and environmental contexts. Non-modifiable risk factors, such as age, gender, and genetic predisposition, also influence disease risk (Viecelli et al., 2022). Because these factors cannot be changed, addressing modifiable risks becomes especially critical. For instance, gender may shape exposure to risk through social norms around smoking, alcohol use, or physical inactivity, which are themselves reinforced by broader structural inequalities (Hunter & Redd, 2013).

Environmental changes, particularly those linked to climate change, further exacerbate NCD risk. Rising temperatures, more frequent extreme weather events, and worsening air quality directly harm cardiovascular and respiratory health (Romanello et al., 2023). These impacts are disproportionately borne by underserved communities, who often have limited access to safe, high-quality green spaces and face greater exposure to environmental stressors such as air pollution and urban heat (Jennings et al., 2021). Environmental justice is the principle that all people, regardless of race, income, or geography, should have equitable access to environmental benefits and be protected from disproportionate environmental harms, a cornerstone in preventing environmental drivers of NCDs (Prüss-Ustün et al., 2019; Scarpetti et al, 2024). In the context of NCD prevention, addressing environmental justice means improving equitable access to beneficial environments and reducing harmful exposures that drive health disparities (Prüss-Ustün et al., 2019). Understanding how non-modifiable factors interact with modifiable ones enables more tailored and effective prevention strategies. This is important globally, with particular urgency in settings where the burden of NCDs is increasing rapidly, such as many LMIC (Islam et al., 2014).

1.5 Lifestyle Modification and the Primary and Secondary prevention of NCD

With so many modifiable risk factors associated with NCDs it is clear that supporting and encouraging lifestyle change can have a positive impact on health outcomes. One problem associated with lifestyle change and unhealthy behaviours, however, is that many people know what to do to improve their health but navigating the psychological and social complexities of the necessary behaviours in order to change it can be difficult (Kelly and Barker., 2016). Both primary and secondary prevention activities are needed to tackle the underlying global, societal, and environmental causes as well as, to ensure early diagnosis and effective treatment options to reduce the prevalence of NCDs (Peters et al 2020).

Primary prevention aims to stop people from developing NCDs by, for example, maintaining a healthy lifestyle such as eating a healthy diet and exercising (Karunathilake and Ganegoda., 2018). This focus relies heavily on influencing individuals’ behaviours; however, it is also one that is widening the health inequality gap with many unable to access the means to live a healthy lifestyle and prevent poor health conditions. In 2015, the world’s leaders committed to taking measures to reduce premature deaths by NCDs by one third by 2030. The measures involve introducing and implementing a number of policy changes all of which are checked by NCD progress monitoring indicators (WHO, Noncommunicable Diseases Progress Monitor., 2020). The changes include increasing taxes on tobacco and alcohol, introducing smoke free legislation in public areas, saturated fatty acids/trans-fat and salt/sodium policies, implementing health warning campaigns and enforcing bans on advertising.

Secondary prevention aims to detect a diagnosis early and provide treatments to avoid permanent damage (Karunathilake & Ganegoda, 2018). This is particularly important for identifying individuals who are ‘at risk’ of developing a NCD, enabling timely and targeted interventions (WHO, 2020). In many cases, this involves implementing lifestyle changes that focus on modifiable risk factors, such as physical inactivity, poor diet, smoking, and alcohol use, or introducing medical treatments to reduce overall risk (Peters et al., 2019; NICE, 2022). In the UK, secondary prevention efforts are supported through structured programmes including the NHS Health Check, the NHS Stop Smoking Service, the NHS Diabetes Prevention Programme (DPP), and various hospital-based services aimed at early diagnosis and long-term risk reduction (Public Health England, 2017; NHS England, 2023). However, recent research has highlighted how the COVID-19 pandemic significantly disrupted access to these preventive services. As health systems shifted their focus toward acute pandemic response, routine care and early detection efforts were deprioritised or suspended, particularly for individuals with or at risk of NCDs (Sheldon & Wright, 2020). These disruptions have contributed to delayed diagnoses, gaps in treatment initiation, and reduced access to behavioural support services. Moreover, emerging evidence suggests that such impacts have persisted beyond the acute phase of the pandemic, exacerbating existing health inequalities and compounding long-term risks for vulnerable populations (Frontiers in Public Health, 2024; Romanello et al., 2023).

Whether focused on primary or secondary prevention, the success of public health interventions aimed at reducing NCDs ultimately depends on individuals’ capacity and willingness to change their behaviours (Kelly & Barker, 2016). Lifestyle interventions, such as those promoting physical activity, healthy eating, or smoking cessation, are only effective if they succeed in facilitating sustained behavioural change (Dean & Soderlund, 2015; Michie et al., 2011). Therefore, a deeper understanding of the psychological, social, and environmental factors that shape health behaviours is essential. The next section explores the theoretical and empirical foundations of health behaviour change, which underpin the development of effective interventions targeting NCD prevention and management (Davidoff et al., 2015; Bandura, 1986).

1.6 Health Behaviour Change and the Role of Nature

Lifestyle changes such as healthy eating, smoking cessation, reducing alcohol intake, and regular physical activity are well established as effective strategies for preventing and managing NCDs (Dean & Soderland, 2015). Policymakers and public health authorities have long sought to promote these behaviours, but many initiatives have had limited success (Davis et al., 2014; Kelly & Barker, 2016). This is partly due to the complexity of human behaviour, which is shaped by a dynamic interplay of habit, automatic responses, conscious decision-making, and broader social and cultural influences.

Kelly and Barker (2016) argue that many interventions fail because they rely too heavily on the provision of information, without sufficiently addressing motivation, environmental support, and the behavioural science underpinning human action. Davidoff et al. (2015) similarly contend that interventions often lack a clearly defined theory of change and fail to specify the behaviours, mechanisms, and social processes they aim to influence. For meaningful health behaviour change to occur, interventions must be grounded in theory and capable of addressing both psychological and structural factors (Rothman, 2004).

A central concept in this regard is agency, the capacity of individuals to act intentionally and effect change in their lives (Bandura, 2001). Bolton and Gillett (2017) emphasise the role of embodied agency in health, arguing that the ability to exert control and make purposeful decisions is fundamental to both mental and physical wellbeing. This concept is reinforced by Bandura's Social Cognitive Theory (SCT; 1986), which distinguishes between personal agency, self-initiated control over one's actions, and interpersonal agency, whereby individuals rely on others to help achieve desired outcomes (Bandura, 2001).

Within SCT, two constructs are particularly central to sustained behaviour change: self-efficacy and self-regulation. Self-efficacy refers to an individual's belief in their capability to organise and execute the actions required to manage prospective situations (Bandura, 1997). It determines how people think, feel, and act in the face of challenge and strongly predicts persistence, effort, and resilience in adopting health behaviours (Beauchamp et al., 2019). Self-regulation refers to the self-directed processes by which individuals set goals, monitor progress, and adjust behaviour in line with internal standards or desired outcomes (Cameron et al., 2017; Carver & Scheier, 1998). Effective self-regulation enables individuals to translate intentions into sustained action, particularly when confronted with competing demands or environmental barriers. Together, these mechanisms operationalise personal agency by linking motivation and intention to concrete, goal-directed behaviour (D'Souza et al., 2015; Petit et al., 2016; Renes & Aarts, 2017).

Interpersonal forms of agency further underscore the importance of social relationships in shaping behaviour. Bandura (2001) identifies proxy agency, where individuals depend on others with authority or resources (e.g., a GP recommending a NBI) and collective agency, where group dynamics and shared efficacy drive community-level change. These interpersonal mechanisms are particularly relevant to community health interventions, where social capital, peer influence, and mutual support play pivotal roles (Christakis & Fowler, 2007; Pretty et al., 2007; Southby et al., 2021). Through these pathways, individuals can co-create environments that support and reinforce healthier choices.

Agency also influences risk perception, a critical factor in health-related decisions. Gneezy, Imas, and Jaroszewicz (2020) found that people with a stronger sense of agency tend to make more accurate risk assessments and show greater patience in working toward long-term health outcomes. According to SCT, this is due to the role of self-efficacy in enabling individuals to visualise success and persevere through setbacks. Moreover, positive feedback and achievement further strengthen self-efficacy (Beauchamp et al., 2019), while self-regulation acts as the sustaining mechanism that maintains behaviour over time (Cameron et al., 2017). A growing body of empirical evidence supports the connection between nature and health. Time spent in green space is associated with lower stress levels, improved mood, higher physical activity, and greater social interaction, all of which are important for both the prevention and management of NCDs (Kuo, 2015; Markevych et al., 2017; Twohig-Bennett & Jones, 2018). Group-based activities such as community gardening, green gyms, and walking groups have been shown to promote intrinsic motivation and enjoyment, key predictors of behaviour maintenance (Pretty et al., 2005; Marselle et al., 2019).

These experiences also activate both personal and collective forms of agency, reinforcing an individual's sense of control, social connection, and purpose. Such psychosocial factors are vital for enabling and sustaining behavioural change (Bolton & Gillett, 2017; Christakis & Fowler, 2007; Kirmayer & Gómez-Carrillo, 2019). However, the benefits of nature-based interventions are not evenly distributed. Structural inequalities, cultural barriers, and limited access to safe and welcoming green spaces mean that many individuals, particularly those in marginalised or low-income communities, face significant challenges in engaging with nature in meaningful ways (Jennings et al., 2016; Rigolon, 2016; Shanahan et al., 2015). Addressing these disparities is essential to ensuring that nature-based health promotion strategies are both equitable and effective.

To strengthen understanding of why nature works and how these benefits are achieved, Wilkie and Davinson (2021) propose a conceptual framework that unpacks the causal chain between nature exposure and health outcomes. This model differentiates between superordinate pathways, nature exposure and nature experience, and their associated pathway domains, such as restoring capacities (psychological restoration), building capacities (physical activity and social engagement), and reducing harm (e.g., air pollution mitigation). Within each domain, mechanisms such as emotional regulation, cognitive restoration, and behaviour regulation act as the 'white boxes' that explain how specific outcomes occur. Their review highlights the importance of specifying the intended mechanism within interventions, e.g., whether reduced anxiety results from sensory immersion in nature, increased physical activity, or enhanced social interaction.

Critically, they argue that many existing NBIs lack this theoretical precision and do not employ established behaviour change techniques (BCTs). Incorporating frameworks such as COM-B (Capability, Opportunity, Motivation – Behaviour) and the Theoretical Domains Framework (TDF) enables more structured and testable intervention design. These models help identify whether NBIs increase an individual’s physical or psychological capability to act, improve their opportunity (e.g., through access or social support), or enhance their motivation (via beliefs, intentions, or emotions). When NBIs target these mechanisms explicitly, such as by setting goals, providing feedback, or encouraging social modelling, they are more likely to achieve sustained health behaviour change.

Their synthesis also underscores the need for greater methodological clarity in evaluating outcomes. By mapping NBIs to defined pathways and mechanisms, it becomes possible to determine which elements of the nature experience are most impactful and for whom, a necessary step in developing equitable and scalable public health strategies.

To fully harness the behavioural and therapeutic potential of nature, structured systems must be in place to help individuals access and engage with it. Given nature's alignment with psychological and behavioural mechanisms of health, it is essential to examine the outcomes associated with nature-based interventions. The following section explores what is known about the physical, psychological, and social impacts of engaging with natural environments, and how these outcomes may contribute to the prevention and management of NCDs.

1.6.1 *Physiological Health Outcomes*

Non-communicable diseases (NCDs) such as cardiovascular disease (CVD), type 2 diabetes, respiratory illness, and cancer continue to represent the leading causes of mortality globally (Pearce et al., 2015). Prevention efforts increasingly focus on modifiable upstream factors, namely, the social and environmental conditions that influence physiological risk pathways, meaning the biological systems through which psychosocial and environmental exposures become embodied and increase disease risk (Prüss-Üstün et al., 2019). Central among these are the systems most commonly dysregulated in chronic disease: immune function, stress response, metabolic control, and sleep architecture (Egger et al., 2017; Hotamisligil, 2006; McEwen & Gianaros, 2010). These systems are not isolated; they interact dynamically in ways that compound risk over time. For example, chronic stress can impair immune regulation, poor glycaemic control increases inflammatory load, and sleep disturbances exacerbate all three (Singh et al., 2024).

In modern urban conditions, characterised by long working hours, limited access to green space, and high environmental noise, these physiological pathways are often chronically activated, elevating stress hormones, disrupting sleep, and contributing to metabolic dysregulation (Garbarino et al., 2021). Crucially, a growing body of evidence indicates that exposure to natural environments can beneficially modulate these same systems, reducing stress biomarkers, improving sleep quality, and supporting immune function, making nature a promising lever for population health improvement (Twohig-Bennett & Jones, 2018).A growing number of experimental and epidemiological studies demonstrate that contact with nature improves immune function, reduces markers of systemic inflammation, and may enhance resistance to viral and bacterial infections (Antonelli et al., 2020; Hanski et al., 2012; Li, 2010). Forest bathing, a practice originating in Japan known as shinrin-yoku, which involves slow, mindful immersion in forest environments rather than physical bathing, has, for example, been associated with increased natural killer (NK) cell activity, immune cells that play a crucial role in detecting and destroying virus-infected or cancerous cells, and reduced concentrations of pro-inflammatory cytokines (Li et al., 2008). These immune-enhancing effects are thought to be mediated by a combination of biological agents and microbial exposures. In particular, phytoncides, antimicrobial volatile organic compounds released by trees, have been shown to influence human immune function when inhaled, while exposure to biodiverse soils may introduce beneficial microorganisms such as Mycobacterium vaccae (M. vaccae), a non-pathogenic environmental bacterium known to interact with both the immune and nervous systems. M. vaccae has shown promising effects on the serotonergic system and stress resilience, potentially modulating mood and inflammatory responses (Lowry et al., 2007; Rook, 2013).

Nature exposure is also associated with robust reductions in stress biomarkers, including cortisol, adrenaline, and dehydroepiandrosterone (DHEA), alongside improved parasympathetic nervous system activity (Gidlow et al., 2016; Park et al., 2010). These physiological changes support not only subjective wellbeing but also reduce the wear-and-tear effects of allostatic overload, a cumulative biological burden that underlies many NCDs (McEwen, 2007). Allostatic load refers to the cumulative physiological strain resulting from repeated or chronic stress, involving systems such as the Hypothalamic-Pituitary-Adrenal (HPA) axis, immune function, and metabolic regulation. Recent work by Lee et al. (2024) provides experimental evidence that nature exposure can reduce this biological burden, with measurable reductions in cortisol, inflammatory markers, and cardiovascular strain among participants exposed to urban environmental stressors. Similarly, glucose regulation may benefit from time spent in green environments: observational studies have linked residential greenness with improved glycaemic control in both diabetic and non-diabetic populations (Brown et al., 2014). Experimental studies further suggest that outdoor physical activity, particularly in biodiverse environments, improves insulin sensitivity and metabolic flexibility (Thompson Coon et al., 2011).

In addition to these mechanisms, sleep quality, increasingly recognised as a critical factor in NCD prevention (Gómez-Olivé et al., 2018), is improved by regular exposure to natural light patterns, reduced nighttime light pollution, and the calming sensory qualities of green space (Astell-Burt et al., 2013; Grigsby-Toussaint et al., 2015). These effects are particularly important given evidence linking poor sleep to hypertension, obesity, immune dysfunction, and type 2 diabetes (Buxton & Marcelli, 2010; Irwin & Cole, 2011).

Kuo’s (2015) framework synthesises this body of research, identifying 21 pathways through which nature may influence health, including biological, behavioural, environmental, and psychological routes. His model provides a compelling logic chain to explain how environmental exposure translates into physical health outcomes. However, the framework does not suggest that nature operates automatically or universally. Rather, its effectiveness depends on meaningful, repeated engagement, a point often underemphasised in discussions of passive greenness or incidental exposure.

While Kuo’s work is foundational for mapping the physiological plausibility of nature-health relationships, this thesis builds on it to ask a broader evaluative question: Do nature-based interventions (NBIs) activate these mechanisms in ways that are meaningfully different from other forms of interventions? For instance, are improvements in immune, metabolic, or stress-related function more consistently observed in NBIs due to their sensory, physical, or social characteristics? Or could similar physiological benefits be derived from other activities, such as group exercise or arts-based interventions, under comparable behavioural conditions? These comparative questions are central to assessing the unique public health value of NBIs, especially as they become more widely promoted in policy.

At the same time, it is essential to acknowledge that physiological benefits rely on consistent engagement, which is not equitably distributed (Jennings et al., 2016; Rigolon, 2016). Factors such as perceived safety, cultural relevance, accessibility, and time availability continue to mediate who participates and how often (Cleary et al., 2017; Shanahan et al., 2015). Thus, the effectiveness of NBIs must be understood not only in biological terms, but also in terms of reach, uptake, and inclusivity. In this thesis, both dimensions (effectiveness and accessibility) are explored to determine whether NBIs offer practical and equitable value relative to other intervention options. Framing nature not merely as an environmental amenity but as a strategic health asset (Harper et al., 2025) reinforces the importance of evaluating it as a proven intervention and a system-level investment. Additionally, simulated nature experiences, delivered through virtual reality or digital media, have demonstrated similar short-term physiological benefits to in-person exposure. For individuals unable to access outdoor environments, these interventions can offer a viable adjunct for stress regulation and wellbeing support (Browning et al., 2020; Litleskare et al., 2020), particularly in clinical or urban settings where traditional green space is limited.

1.6.2 *Psychological Wellbeing*

As discussed in Section 1.2, this thesis adopts a focused definition of NCDs that excludes clinical mental illnesses, such as diagnosed depression and anxiety disorders, while still recognising the broader significance of mental health in shaping physical health outcomes. This distinction enables a clearer analytical framework and underscores the importance of psychological wellbeing as a key intersecting factor in the prevention and management of physical NCDs.

The psychological benefits of exposure to natural environments are among the most consistently observed outcomes in environmental health research. Time spent in green or blue space is associated with reduced symptoms of depression and anxiety, lower levels of stress and rumination, and improvements in mood, emotional regulation, and cognitive function (Bowler et al., 2010; Hartig et al., 2014; White et al., 2021). These effects are not limited to general wellbeing; they have significant implications for the prevention and management of NCDs, given the well-established links between psychological distress and physical health outcomes (Cohen et al., 2007; Chrousos, 2009; Prince et al., 2007).

Mental health and physiological function are deeply interconnected. Chronic psychological stress contributes to immune dysregulation, promotes insulin resistance, exacerbates inflammation, and impairs cardiovascular function (Egger et al., 2017; McEwen & Gianaros, 2010). Likewise, poor mental health is associated with unhealthy behaviours, such as sedentary lifestyles, poor diet, and smoking, that further increase NCD risk (Stein et al., 2019). This makes the psychological benefits of nature exposure not just a parallel outcome, but a core component of any effective public health strategy.

A growing body of evidence supports these links. Randomised controlled trials and observational studies have found that walking in natural environments improves mood, reduces negative thinking, and enhances cognitive performance, compared to walking in urban environments (Berman et al., 2008; Bratman et al., 2015). Meta-analyses by McMahan and Estes (2015) and Twohig-Bennett and Jones (2018) confirm moderate effects of nature exposure on both positive and negative affect across diverse settings. Longer-term studies also suggest that green space exposure may buffer against psychological distress and even reduce the incidence of psychiatric disorders over time (Engemann et al., 2019).

NBIs, including green exercise, horticultural therapy, and wilderness programmes, have shown positive outcomes in both clinical and non-clinical populations. For example, a systematic review by Coventry et al. (2021) found that NBIs were associated with reductions in depression, anxiety, and stress, while also enhancing self-esteem and resilience. These findings have particular relevance for at-risk groups, including individuals with chronic illness, low socioeconomic status, or high baseline stress, where the mental health benefits of NBIs may have downstream effects on disease prevention and management.

However, as with physiological benefits, these psychological gains are not guaranteed by proximity to green space alone. They depend on sustained and meaningful engagement, which is shaped by a range of social and contextual factors. Perceptions of safety, cultural relationships with nature, mobility limitations, and competing responsibilities can all constrain opportunities for exposure, particularly among marginalised groups (Finlay et al., 2015; Jennings & Bamkole, 2019; Shanahan et al., 2015). These disparities contribute to health inequities by limiting access to one of the few non-stigmatising, low-cost interventions available for mental health promotion. Recent geospatial analyses by Tran et al. (2024) further demonstrate that high-quality green space is systematically less accessible in deprived areas, compounding these barriers and reinforcing structural inequities in mental health outcomes.

These contextual limitations must be addressed to meaningfully evaluate whether NBIs provide mental health benefits that are distinct from, or superior to, other forms of intervention. For instance, are the stress-reducing or mood-enhancing effects of NBIs stronger or more durable than those of arts programmes or peer support groups? Do their multisensory, environmental, or ecological characteristics confer additional value? These are key questions for determining whether NBIs should be prioritised in mental health policy. While equitable access remains a necessary precondition, this thesis positions psychological wellbeing not just as an outcome of engagement, but also as a mechanism through which the comparative value of NBIs can be assessed. Understanding both the potential and the limits of these interventions is central to evaluating their role in NCD prevention.

1.6.3 *Social Health and Behavioural Engagement*

Alongside physiological and psychological outcomes, nature-based interventions (NBIs) offer significant social and behavioural benefits that are directly relevant to health promotion and chronic disease prevention. Social connectedness, a sense of belonging, and sustained engagement in health-supportive behaviours such as physical activity and volunteering are all strongly associated with reduced risk of NCDs, lower mortality, and improved quality of life (Holt-Lunstad et al., 2015; Umberson & Montez, 2010; WHO, 2010). Emerging evidence suggests that natural environments can play a catalytic role in fostering these social and behavioural determinants of health.

NBIs provide unique opportunities for facilitating social interaction, reducing isolation, and strengthening community ties. Activities such as community gardening, nature walks, green volunteering, and group-based conservation work promote both social contact and a shared sense of purpose (Howarth et al., 2020; Maller et al., 2006). These effects are particularly valuable for groups at elevated risk of social isolation, including older adults, people living with chronic illness, and those experiencing socioeconomic disadvantage (Finlay et al., 2015; Soga et al., 2017). For example, studies have shown that community gardening enhances not only mental health and physical activity but also neighbourhood cohesion and trust (Kingsley et al., 2009; Zick et al., 2013). These relational benefits can enhance resilience and serve as protective factors against stress-related health deterioration.

In addition, NBIs have been shown to promote sustained engagement in positive health behaviours. Outdoor physical activity is often perceived as more enjoyable, accessible, and intrinsically motivating than indoor alternatives, increasing the likelihood of long-term adherence (Pretty et al., 2005; Rogerson et al., 2016). Exposure to green space has been associated with higher levels of recreational walking and cycling, particularly when environments are perceived as attractive, safe, and well-maintained (Kaczynski et al., 2008; Sugiyama et al., 2010). For individuals with limited access to formal exercise programmes, NBIs can provide a low-cost, low-barrier alternative to traditional interventions.

Crucially, social interaction and behavioural engagement are not just benefits of NBIs, they are also mechanisms through which physiological and psychological outcomes are enhanced. For instance, group-based nature activities have been shown to generate positive feedback loops: increased mood and social connection enhance motivation to return, while repeated engagement deepens the benefits over time (Marselle et al., 2019). This cumulative effect is particularly important in the context of chronic disease, where lifestyle change requires not just initial uptake but ongoing maintenance. As such, the social and behavioural dimensions of NBIs are central to their potential as sustainable public health strategies.

However, as with the physiological and psychological pathways discussed earlier, access to these social and behavioural benefits is unevenly distributed. Barriers such as inadequate infrastructure, lack of culturally appropriate programmes, limited time and transportation, or exclusionary social dynamics can all reduce participation in NBIs, especially among the very populations who might benefit most (Bell et al., 2018; Jennings et al., 2016; Rigolon., 2016) Without intentional design and inclusive delivery strategies, nature-based programmes risk reinforcing, rather than reducing, existing health inequalities.

For this reason, the social and behavioural dimensions of NBIs must be examined not only as beneficial in themselves, but also as potential mechanisms that differentiate NBIs from other forms of intervention. For instance, does the combination of physical activity, outdoor environments, and peer-based structure foster stronger social cohesion than traditional interventions? Are NBIs more likely to support long-term adherence due to their intrinsic motivation pathways? This thesis explores such questions to evaluate whether the social and behavioural benefits of NBIs represent a distinct advantage in the context of chronic disease prevention. While equitable access remains a critical consideration, the core aim is to determine whether NBIs should be prioritised based on their comparative impact on health-supportive behaviours, especially when scaled within wider NCD prevention strategies.

These questions also raise important implications for service delivery. If nature-based interventions support behaviour change through distinct mechanisms, particularly social connection, sustained engagement, and intrinsic motivation, then they may offer specific advantages over more conventional approaches to lifestyle intervention (Bragg & Atkins, 2016; Marselle et al., 2019). However, without formal referral mechanisms, inclusive design, and integration within broader healthcare systems, many people remain unaware of or unable to access these opportunities (Chatterjee et al., 2018; Husk et al., 2020). To address this gap, health systems have increasingly adopted SP as a means to connect individuals with non-clinical resources that support holistic wellbeing, including nature-based options (Bickerdike et al., 2017; Scarpetti et al., 2024). The following section explores SP in more detail, positioning it as a practical framework to embed NBIs within routine care and enhance their reach and impact.

1.7 Social Prescribing

SP is an innovative, patient-centred approach to healthcare that enables healthcare professionals to refer patients to a range of local, non-clinical services to improve their well-being. It has been widely adopted across various healthcare systems globally, including in Australia, Canada, England, Finland, Germany, the Netherlands, Portugal, and the United States (Scarpetti et al., 2024). SP recognises that health is influenced by a variety of social, economic, and environmental factors and seeks to address these through community-based interventions (Bickerdike et al., 2017).

Recent efforts to standardise the concept of SP have culminated in the development of the Common Understanding of SP (CUSP) framework. Established through a Delphi study involving 48 experts from 26 countries, the CUSP framework (Muhl et al., 2023) provides internationally accepted conceptual and operational definitions to guide the implementation, evaluation, and comparison of SP initiatives across global contexts. At its core, the framework defines SP as “a holistic, person-centred, and community-based approach to health and wellbeing that bridges clinical and non-clinical support.” It identifies five key components: (1) the identifier (typically a health or care professional who recognises a non-medical need); (2) the connector (often a link worker who co-produces a plan with the individual); (3) the recipient (the person being socially prescribed to); (4) the scheme or pathway that structures the referral and follow-up process; and (5) the wider community system of local assets and organisations. The framework also emphasises core values including empowerment, equity, and collaboration.

The National Health Service (NHS) in the United Kingdom has been a pioneer in implementing social prescribing (SP) at a systemic level. The NHS is the publicly funded healthcare system of the UK, providing comprehensive health services free at the point of use for residents (NHS, 2024). In its 2029–2039 Ten-Year Plan, the NHS outlines three major strategic shifts: from treatment to prevention, from hospital to community-based care, and from a focus on illness to wellbeing and personalised care (NHS England, 2024). SP represents a core mechanism for delivering these shifts in practice by addressing the social and behavioural determinants of health through non-clinical, community-based interventions.

Building on the 2019 Long-Term Plan, which formally integrated SP into primary care networks, the new strategy positions SP as central to prevention and early intervention efforts, aiming to reduce pressure on general practitioners (GPs) and hospital services while improving holistic patient outcomes (NHS England, 2019, 2024). GPs, as the first point of contact within the healthcare system, play a key role in identifying suitable patients and linking them to appropriate community-based activities and support (House of Commons Library, 2024).

Within the NHS, SP is primarily delivered through Primary Care Networks (PCNs), groups of GP practices that collaborate to provide coordinated care to local populations (NHS England, 2021). PCNs facilitate the delivery of integrated, personalised healthcare by connecting patients with link workers, who support individuals in accessing community resources such as exercise programmes, social clubs, housing support, and mental health services (Kimberlee, 2015). This approach has been shown to alleviate pressure on primary care, enhance mental and physical wellbeing, and strengthen community connectedness (Polley et al., 2017).

Recent national evidence highlights the extent of this expansion. A longitudinal study of over 1.2 million patients across 1,736 GP practices found that between 2019 and 2023, SP was recorded in an estimated 9.4 million GP consultations, with 5.5 million resulting in referrals. In 2023 alone, around 1.3 million patients were referred, exceeding the NHS Long Term Plan target of 900,000 by as much as 52%. Encouragingly, representation from patients in the most deprived areas rose from 23% in 2017 to 42% in 2023, and uptake among minority ethnic groups surpassed their population share. Nonetheless, disparities in uptake remain across age, sex, and rurality, indicating that equity challenges persist (Bu et al., 2025).

While the potential of SP is widely acknowledged, implementation is often hindered by systemic challenges such as inconsistent funding, limited awareness among healthcare providers, and inadequate training in behaviour change strategies (Fixsen et al., 2020; Husk et al., 2020). Stakeholders frequently cite the need for more structured referral pathways, long-term investment in VCSE (voluntary, community and social enterprise) partnerships, and ongoing professional development to fully integrate SP into primary care (Chatterjee et al., 2018; Drinkwater et al., 2019). Recent qualitative work by Calderón-Larrañaga et al. (2024) reinforces these concerns, highlighting how frontline practitioners often operate within significant constraints that shape their delivery style. In their study, SP was enacted in one of three ways, adaptively ("I do what it takes"), constrainedly ("I do what I can"), or rigidly ("I do as I'm told"), depending on available resources, autonomy, and inter-professional dynamics. These patterns illustrate how systemic pressures can limit the potential of SP to meet complex or personalised health needs, particularly in underserved communities.

The growing recognition of SP as a valuable healthcare tool highlights its role in addressing social determinants of health and promoting holistic care (Smith et al., 2022). As more countries explore and adopt similar models, ongoing research and policy development will be essential to optimising its implementation and ensuring sustainable healthcare benefits worldwide (Smith et al., 2022).

1.7.1 *Social Prescribing as a Behaviour Change Intervention for NCDs*

SP offers a practical application of behaviour change theory within healthcare settings, particularly in the context of NCD prevention and management (Husk et al., 2020; Pescheny, Randhawa & Pappas, 2018). While earlier sections of this chapter explored the conceptual foundations of behaviour change, including agency, self-efficacy, and the role of social context, this section focuses on how SP operationalises these constructs in real-world practice.

Unlike traditional interventions that rely primarily on information provision or clinical advice, SP connects individuals to community-based resources that address psychological, social, and environmental barriers to change (Kelly & Barker, 2016; Davis et al., 2014). In doing so, it reflects a shift from solely biomedical approaches toward more holistic and person-centred care. Core behavioural theories, such as Bandura's SCT (1986) and the Health Belief Model (Rosenstock, 1966), emphasise that knowledge alone is insufficient to change behaviour. Instead, lasting change requires confidence, motivation, and opportunities to act within supportive environments (Beauchamp, Crawford & Jackson, 2019; Bolton & Gillett, 2017).

SP supports behaviour change by facilitating these conditions. Link workers play a key role in helping individuals identify goals, build confidence, and navigate local services that align with their interests and needs (Fixsen et al., 2020). Whether through exercise classes, peer support groups, or arts activities, SP pathways aim to foster autonomy, promote self-regulation, and embed behaviour change within meaningful social contexts (Deci & Ryan, 2000; Southby et al., 2021). These features make SP a promising tool for addressing lifestyle-related risk factors for NCDs (Dean & Soderlund, 2015).

Critically, SP does not directly deliver behaviour change or interventions; rather, it operates as a referral and support system that connects individuals to appropriate community-based activities and services, thereby creating the structural and relational conditions in which healthier behaviours can emerge and be sustained. Its emphasis on collaboration, empowerment, and community engagement resonates with contemporary understandings of health behaviour as socially embedded and dynamically influenced (Christakis & Fowler, 2007; Kirmayer & Gómez-Carrillo, 2019). The effectiveness of SP, therefore, lies not in a single model of behaviour change, but in its capacity to integrate multiple psychological, social, and environmental influences into a cohesive intervention framework.

As the next section demonstrates, this adaptability makes SP suitable for connecting individuals to a wide range of community-based activities and services. Understanding how different types of SP referrals engage behavioural mechanisms is key to evaluating their potential. Section 1.7.2 explores this in greater detail by examining the diversity of activities accessed through SP and their varying impacts on health and wellbeing.

1.7.2 *Activities and Interventions Accessed Through Social Prescribing*

SP referrals are highly diverse and flexible, tailored to individual needs and shaped by the availability of local community resources (Southby & Gamsu, 2018; Fixsen et al., 2020). This adaptability is one of SP's key strengths, enabling it to address a wide range of non-clinical determinants of health and wellbeing, including loneliness, stress, unemployment, and housing insecurity (Drinkwater et al., 2019; Chatterjee et al., 2017). By connecting individuals to local activities, groups, and support services, SP aims to strengthen social connections, improve mental health, and enhance overall quality of life (Bickerdike et al., 2017; Husk et al., 2019; UK Government, 2023).

The activities accessed through SP encompass a broad spectrum of non-medical opportunities that promote social connectedness, skill development, and personal agency. These may include arts and crafts workshops, reading groups, physical activity sessions such as walking clubs or dance classes, educational courses, job-readiness and skills training, volunteering opportunities, and welfare-related advice on housing, debt, employment, and legal matters (NHS England, 2023; Southby & Gamsu, 2018; The King's Fund, 2020). Evidence indicates that participation in such community-based programmes can lead to improvements in mental health, reductions in loneliness, increased self-esteem, and fewer visits to primary care services (Bickerdike et al., 2017; Carnes et al., 2017; Husk et al., 2020; Kimberlee, 2015).

The scope of provision within SP can be substantial. In Newcastle upon Tyne (UK), for example, more than 180 distinct community activities were available for referral, illustrating the breadth and richness of SP offerings where community infrastructure is strong and well-integrated with local healthcare services (Drinkwater, Wildman, & Moffatt, 2019). However, this level of provision is not uniform across the country and depends heavily on the capacity of local Voluntary, Community, and Social Enterprise (VCSE) sectors (Fixsen et al., 2020; Southby, South, & Bagnall, 2019). The variability in provision highlights broader structural challenges related to funding, workforce capacity, and the long-term sustainability of SP-linked services (Bertotti et al., 2018; Dayson & Bashir, 2014; Younan et al., 2020).

A persistent concern within the field is the precarious nature of funding for the VCSE sector, which underpins much of the delivery of SP-linked activities. Many community organisations operate on short-term grants or limited budgets, constraining their ability to scale provision or plan sustainable services (Bertotti et al., 2018; Fixsen et al., 2020). This financial instability threatens the long-term viability of SP, particularly as demand grows and the model becomes increasingly embedded within primary care. Sustaining SP at scale will require strategic investment in community assets, long-term cross-sector partnerships, and a continued commitment to addressing health inequalities through collaborative, person-centred approaches (Southby et al., 2021; Younan et al., 2020).

1.7.3 *Nature-based interventions within Social Prescribing*

NBSPs, sometimes referred to as green prescription, are increasingly recognised for their health-promoting potential (Wood et al., 2022). These interventions include community gardening, conservation volunteering, forest bathing (Shinrin-yoku), green gyms, and guided nature walks (Natural England, 2016; NHS England, 2023). A growing body of evidence links exposure to green spaces with reduced stress, improved mood, increased physical activity, and even lower mortality rates (Twohig-Bennett & Jones, 2018; van den Bosch & Sang, 2017). Such interventions are particularly effective for individuals with mild to moderate mental health conditions and those experiencing social isolation, fostering a sense of purpose, belonging, and connection to the environment (DEFRA & DHSC, 2020; Pretty et al., 2007). A review by Jepson (2010) highlighted that NBSPs vary by level of care: primary care referrals typically involve accessible activities like walking groups, whereas secondary care settings may include structured programmes such as horticulture therapy, conservation work, or green gym sessions.

A prominent example of a NBSP in practice is the Parkrun initiative, which has gained substantial traction within general practice. Over 700 GP surgeries in the UK have formally registered to refer patients to Parkrun, a free, weekly, timed 5km run held in parks across the country (NHS England, 2019; Parkrun UK, 2022). Qualitative research suggests that participation fosters a sense of achievement, belonging, and enhanced social connectedness (Morris & Scott, 2017; Rooke, 2018). These psychosocial benefits are associated with improved health behaviours and outcomes, particularly through reductions in social isolation and the promotion of regular physical activity (Cleland et al., 2019; Holt-Lunstad et al., 2015; Stevinson et al., 2015).

While Parkrun has been widely endorsed within NBSP frameworks for its accessibility and low cost (Khanji et al., 2022; Morris & Scott, 2017), some scholars have expressed concern about the growing tendency to formally “prescribe” such community-led activities. McCartney (2025) argues that medicalising initiatives like Parkrun reframes voluntary, enjoyable participation as clinical compliance, potentially undermining both patient autonomy and the peer-led ethos that makes such events engaging. This perspective echoes broader critiques of the medicalisation of everyday life and the importance of protecting intrinsically motivated health behaviours (Illich, 1976; Mol, 2008). These tensions raise important questions about how NBSPs are framed and operationalised within healthcare systems, and whether their value risks dilution when absorbed into biomedical delivery models. A growing body of research suggests that preserving the relational, ecological, and community-centred nature of NBSPs demands thoughtful policy design and implementation (Bragg & Leck, 2017; Fixsen et al., 2020). As such, their integration into SP pathways must strike a careful balance between clinical endorsement and community empowerment.

Alongside Parkrun, community gardens represent another effective and multifaceted NBSP. In addition to promoting healthier eating habits, these spaces act as hubs of preventative health, combining social, cultural, environmental, and biological dimensions of wellbeing (Draper & Freedman, 2010; McVey, Nash & Stansbie, 2018; Wakefield et al., 2007). They exemplify how NBSPs can holistically support both mental and physical health while strengthening community ties through enhanced social interaction, collective efficacy, and environmental stewardship (Genter et al., 2015; Hartwig & Mason, 2016; Kingsley, Townsend & Henderson-Wilson, 2009).

Despite a growing body of evidence supporting the health benefits of nature, it’s position within the broader landscape of SP remains unclear. This lack of clarity reflects a broader gap in the literature: while NBSPs are often promoted as uniquely effective, few studies directly compare their outcomes to those of other non-clinical interventions (Bragg & Leck, 2017; Husk et al., 2020; Van den Berg & Wendel-Vos, 2017). Moreover, there is limited understanding of the specific mechanisms through which nature facilitate behaviour change, and whether these mechanisms differ meaningfully from those activated by alternative forms of social prescription (Wilkie & Davinson, 2021a; Davidoff et al., 2015). Without such comparative insight, there is a risk that policy support for

NBSPs is driven more by optimism than by robust evidence. This raises important comparative questions: Do NBSPs better support long-term behavioural change? Are they more effective for certain populations or health outcomes than other commonly prescribed activities? Do their ecological and relational dimensions enhance their impact in ways not replicated by arts, exercise, or peer-based programmes?

Wilkie and Davinson (2021a) conducted a comprehensive scoping review of 52 studies investigating nature-based interventions. They found that while NBIs relevant to NBSPs are associated with modest improvements in psychological wellbeing and physical health, the evidence base remains fragmented. Many studies lacked clear intervention definitions, consistent outcome measures, or theoretical frameworks. Notably, the review concluded that it remains unclear whether NBIs offer distinct or additional value compared to arts-based, peer-led, or other non-clinical interventions. This ambiguity is compounded by a general lack of comparative research and poor integration of NBIs into standard referral pathways. Wilkie and Davinson's findings underscore the need for more rigorous, comparative, and theory-informed evaluation in order to clarify the role of NBIs within SP systems.

At the same time, understanding their comparative potential also requires examining patterns of access and delivery. Evidence suggests that referral rates to NBSPs remain relatively low (Bragg & Leck, 2017; Van den Berg, 2017), raising additional questions about visibility, legitimacy, and structural support. Together, these dual challenges of evaluating relative impact and addressing inconsistent integration, highlight the need for research that not only assesses outcomes but also interrogates how and why NBPS’s may (or may not) deliver distinct value within SP. The following section explores how theory-informed design can support this evaluative agenda.

In summary, while NBSPs align with leading theories of health behaviour change and have demonstrated physiological, psychological, and social benefits (Kaplan & Kaplan, 1989; Ulrich, 1983; Twohig-Bennett & Jones, 2018; Kuo, 2015), their integration into SP remains limited and inconsistent (Bragg & Leck, 2017; Van den Berg, 2017). Although momentum around NBSP policy is growing (NHS England, 2019; DEFRA & DHSC, 2020), there is a notable lack of empirical clarity about how, for whom, and under what conditions NBSPs deliver value (Coventry et al., 2021). Key uncertainties include whether NBSPs generate distinct health outcomes compared to other SP activities, what mechanisms underpin their effectiveness, and how delivery can be made both feasible and equitable across diverse populations (Fixsen et al., 2020; Jennings et al., 2016; Rigolon, 2016). Without addressing these gaps, there is a risk that NBSPs will remain a promising but underutilised public health resource. To explore these questions and inform the design of more inclusive and scalable approaches, this thesis undertakes a three-phase, theory-informed programme of research

1.8 Aims and Objectives.

Despite the growing evidence linking nature exposure to improved health outcomes, NBIs remain underutilised and inconsistently integrated within SP systems (Bragg & Leck, 2017). Where NBSPs are implemented, they are often prescribed narrowly, as settings for physical activity, rather than recognised as multi-modal interventions capable of supporting psychological restoration, social connection, and long-term behaviour change (Kaplan & Kaplan, 1989; Pretty et al., 2007; Ulrich, 1983;). This underuse reflects two key constraints: limited awareness among both patients and practitioners about the breadth of nature's benefits, and systemic barriers to equitable access, delivery, and scale (Fixsen et al., 2020; Bertotti et al., 2018; Jennings et al., 2016).

At the same time, SP is gaining traction as a policy-endorsed approach to reducing health inequalities and addressing lifestyle-related NCDs (NHS England, 2019; Smith et al., 2022). However, the heterogeneity of SP pathways, lack of comparative data on intervention types, and uneven engagement with NBSPs present both challenges and opportunities. In particular, it remains unclear whether NBSPs offer distinct or additional value relative to other forms of SP, such as arts-based or peer-support interventions, and how they might best be embedded within care systems to promote sustainable behaviour change (Bragg & Leck, 2017; Coventry et al., 2021; Wilkie & Davinson, 2021a)

This thesis aims to explore how NBSPs can be more effectively and equitably embedded within SP systems to support long-term health behaviour change and reduce the burden of NCDs. It contributes to both theoretical understanding and practical intervention design by applying established behaviour change models, such as SCT (Bandura, 1986) and the Health Belief Model (Rosenstock, 1966), as well as implementation frameworks, including the Intervention Mapping (IM) Approach (Bartholomew Eldredge et al., 2016), across three sequential, interlinked studies. To achieve this aim, the thesis addresses the following research questions:

1. What influence do social prescriptions have on biological, psychological, and social factors influencing health behaviours?
2. What are the similarities and differences between traditional social prescriptions and nature-based interventions in their impact on health behaviour change?
3. Do different stakeholder groups perceive different opportunities and barriers to using social prescriptions, specifically NBIs?

4. How can NBIs be developed and implemented to facilitate their integration within social prescribing pathways?

These questions are examined through a three-phase, mixed-method programme of research:

- **Study 1: Umbrella Review**

  Synthesises evidence from systematic reviews on the health outcomes of SP interventions, focusing on biological, psychological, and social domains. It also examines whether NBIs demonstrate unique or superior outcomes compared to other SP types (Husk et al., 2020; Twohig-Bennett & Jones, 2018).

  Addresses RQ1 and RQ2.

- **Study 2: Stakeholder Needs Assessment**

  Uses qualitative interviews with healthcare professionals, VCSE staff, and service users to explore lived experiences, perceived barriers and enablers of NBI engagement, and differences in understanding of their value across stakeholder groups

  Addresses RQ3.

- **Study 3: Feasibility and Acceptability Study with Embedded Co-Design**

  Builds on insights from the previous studies to explore the feasibility and acceptability of a nature-based intervention within SP contexts. Using the Intervention Mapping framework, this phase incorporates participatory co-design with stakeholders to ensure the intervention is contextually grounded, behaviourally informed, and responsive to user needs.

  Addresses RQ3 and RQ4. Chapter 5 also contributes to RQ4 by translating needs *assessment findings into a theoretically grounded intervention design using the Intervention Mapping framework*

By combining systematic evidence synthesis, real-world stakeholder insights, and participatory intervention design, this thesis makes a novel contribution to the field of health promotion and behavioural science. It examines not just whether NBSPs are effective, but how, for whom, and under what conditions they are most effective. It also interrogates the mechanisms through which NBSPs support behaviour change, highlighting the roles of self-efficacy, agency, environmental support, and social connection.

In doing so, the research aims to inform policy, practice, and future research on how nature can be strategically leveraged as a health asset, moving beyond passive exposure to active, inclusive, and sustainable engagement within primary care settings. This chapter outlines the theoretical foundations that underpin the design, development, and evaluation of the intervention presented in this thesis. A central challenge in the field of SP and NBSPs is the limited use of theory to guide intervention design, delivery, and evaluation (Davidoff et al., 2015; Prestwich et al., 2014). Without a robust theoretical framework, it becomes difficult to understand mechanisms of action, evaluate efficacy, or ensure that interventions are transferable and sustainable across diverse settings (Michie et al., 2011; O’Cathain et al., 2019).

Chapter 2 Theoretical Framework

2.1 Theoretical Framework at a Glance

This chapter draws on a layered set of theories, models, and frameworks, each serving a distinct and complementary role in the research. Before presenting each in detail, this section provides an orienting overview so that the purpose and relationship of every theoretical component is clear from the outset. The framework operates at three levels, as summarised in Table 2.1 below.

Table 1

Theoretical and Methodological Framework Overview

Theory / Framework	Type	Role in this thesis	Where applied
Biopsychosocial Model (BPS) (Engel, 1977)	Overarching conceptual framework	Provides the unifying model of health across biological, psychological, and social domains	All chapters; structures the logic model (Ch. 5) and synthesis (Ch. 7)
Social Cognitive Theory (SCT) (Bandura, 1986, 2001)	Explanatory/behavioural	Explains self-efficacy, social modelling, and reciprocal determinism as drivers of engagement	Ch. 2 (theory); Ch. 4 (needs assessment interpretation); Ch. 5 (change objectives); Ch. 7 (discussion)
Health Belief Model (HBM) (Rosenstock, 1974)	Explanatory/ behavioural	Explains perceived risk, benefits, and cues to action as determinants of health behaviour	Ch. 2 (theory); Ch. 4 (interpretation); Ch. 5 (change objectives); Ch. 7 (discussion)
Attention Restoration Theory (ART) (Kaplan & Kaplan, 1989)	Explanatory/environmental	Explains how natural environments restore cognitive capacity through involuntary attention	Ch. 2 (theory); Ch. 5 (NBI rationale); Ch. 7 (discussion of mechanisms)

Theory / Framework	Type	Role in this thesis	Where applied
Stress Reduction Theory (SRT) (Ulrich, 1983)	Explanatory/ environmental	Explains rapid affective and physiological stress recovery through nature exposure	Ch. 2 (theory); Ch. 5 (NBI rationale); Ch. 7 (discussion of mechanisms)
Theoretical Domains Framework (TDF) (Cane et al., 2012)	Diagnostic/ applied	Provides 14 theory-derived domains for systematically identifying behavioural determinants from qualitative data	Ch. 2 (framework); Ch. 5 (needs assessment diagnosis and matrix development)
Intervention Mapping (IM) (Bartholomew Eldredge et al., 2016)	Planning/ intervention design	Provides the six-step structured process linking needs assessment to theory-based change methods and evaluation	Ch. 2 (framework selection); Ch. 5 (Steps 1–3); Ch. 6 (Step 4); Ch. 7 (evaluation)
IM Taxonomy of Behaviour Change Methods (Kok et al., 2016)	Planning/ method selection	Catalogues theory-linked change methods and specifies conditions for effective use	Ch. 5 (method selection within IM steps)
TTM, TPB, SDT (Prochaska & DiClemente, 1983; Ajzen, 1991; Deci & Ryan, 2000)	Considered but not adopted as primary frameworks	Reviewed for relevance; excluded due to limitations in structural sensitivity, scope, or SP context applicability	Ch. 2 (Section 2.6, brief exclusion rationale)

The theories in this framework are not applied in isolation. Rather, they operate in an integrated, layered fashion within the overarching BPS model. The two groups of explanatory theory, behavioural (SCT, HBM) and environmental (ART, SRT), address complementary questions: SCT and HBM explain how individuals decide whether to engage with a health behaviour and what psychological and social factors shape that decision, while ART and SRT explain why natural environments in particular create the conditions that make engagement possible and restorative. These two streams of theory are therefore not parallel alternatives but mutually reinforcing lenses. The psychological readiness that SCT and HBM describe is both facilitated and sustained by the restorative and stress-reducing properties of nature that ART and SRT illuminate. This interplay is discussed in detail in Section 2.12 and is visualised in Figure 2.1.

The diagnostic and planning frameworks, TDF and IM, then translate this theoretical understanding into a structured intervention design process. TDF provides the analytical vocabulary for identifying which specific determinants need to change (across cognitive, emotional, social, and environmental domains), while IM specifies how to translate those determinants into concrete change objectives and evidence-based strategies. Together, they operationalise the BPS model and the explanatory theories into a replicable, theory-transparent intervention. The remainder of this chapter presents each element of this framework in the depth needed to justify these choices.

2.2 Chapter Overview

This chapter begins by situating the research within a critical realist ontological perspective (Bhaskar, 1975; Sayer, 2000) and a pragmatic epistemological stance (Feilzer, 2010; Kaushik & Walsh, 2019), which together support a mixed-methods approach grounded in real-world problem-solving. It then explores the importance of theory in shaping behaviour change interventions, particularly those targeting lifestyle-related NCDs, where understanding the interplay between individual, social, and environmental determinants is crucial (Bandura, 2001; Kelly & Barker, 2016).

Several intervention development frameworks are reviewed for their relevance to complex public health interventions, including IM (Bartholomew Eldredge et al., 2016), the Behaviour Change Wheel (Michie, Atkins, & West, 2014), and the Medical Research Council (MRC) framework for complex interventions (Skivington et al., 2021). Foundational behaviour change theories, such as the HBM (Rosenstock, 1974), SCT (Bandura, 1986), and Self-Determination Theory (SDT; Deci & Ryan, 2000), are then introduced, alongside environment-health theories including ART (Kaplan & Kaplan, 1989) and SRT (Ulrich, 1983), which help explain the psychological and physiological effects of natural environments.

These theoretical perspectives collectively inform the development of the intervention explored in this thesis. They provide a structured rationale for the selection of specific intervention components, ensuring coherence between the behavioural objectives, delivery mechanisms, and intended outcomes. By grounding the intervention in well-established theory and evidence, this chapter lays the foundation for a design process that is both scientifically rigorous and contextually relevant (Bartholomew Eldredge et al., 2016; Michie et al., 2011).

2.3 Ontological and Epistemological Foundations

This thesis is underpinned by a critical realist ontology and a pragmatic epistemology, an integrated philosophical foundation that guided the research design, methodological choices, and interpretation of findings. Ontology concerns the nature of reality and what can be known about it (Crotty, 1998). From a critical realist perspective, an objective reality exists independently of human perception; however, our understanding of that reality is inevitably partial, shaped by social, cultural, and individual contexts (Archer et al., 1998; Bhaskar, 1975). In the context of SP and NBIs, this means that while phenomena such as NCDs, wellbeing, and interactions with nature have real, material effects, these effects are experienced, interpreted, and acted upon differently depending on personal circumstances and broader environmental and structural conditions (Sayer, 2000).

Critical realism supports a layered understanding of reality, encompassing the real (underlying structures and mechanisms), the actual (events that occur, observed or not), and the empirical (experiences as recorded and interpreted) (Bhaskar, 1975). It enables researchers to investigate both observable outcomes, such as physiological or behavioural changes, and the underlying mechanisms, such as empowerment, environmental access, or social connectedness, that produce these outcomes (Maxwell, 2012). This ontological orientation directly supports the mixed-methods approach employed in this study, valuing both quantitative findings and qualitative insights as necessary to understand complex, biopsychosocial phenomena (Fletcher, 2017).

Complementing this ontological position is a pragmatic epistemology, which focuses on the utility of knowledge and the practical consequences of research. Pragmatism holds that knowledge is constructed through experience, interaction, and action, and it prioritises inquiry that is action-oriented, context-sensitive, and solution-focused (Kaushik & Walsh, 2019). Rather than aligning rigidly with positivist or interpretivist traditions, pragmatism offers a pluralistic framework that allows for the flexible use of methods to address real-world problems (Tashakkori & Teddlie, 2010).

The selection of mixed methods, including an umbrella review and qualitative studies, reflects this pragmatic stance. These methods were chosen for their capacity to produce actionable insights that are relevant to healthcare and public health practice (Creswell & Plano Clark, 2018; Roy, 2020). As Feilzer (2010) argues, pragmatism enables researchers to choose tools that are most appropriate for the research question rather than those dictated by methodological orthodoxy.

By combining critical realism and pragmatism, this thesis is positioned to uncover both patterns in behaviour and health outcomes and explore the deeper meanings, mechanisms, and contextual enablers underlying engagement with SP and NBIs. This philosophical integration ensures that the research remains both theoretically grounded and practically relevant.

As a researcher with professional experience in behavioural health and a personal interest in environmental wellbeing, I acknowledge the influence of my positionality on the framing and interpretation of this work. Reflexivity was maintained throughout the research process by engaging diverse participant perspectives and anchoring interpretations in established theoretical frameworks.

2.4 The role of theory in intervention design

Theories of behaviour change play a pivotal role in shaping the design, implementation, and evaluation of health interventions. Their value lies in providing a bridge between abstract understanding and practical application, enabling intervention developers to move beyond intuition and instead ground strategies in established principles (Davidoff et al., 2015; O'Cathain et al., 2019). By clarifying hypothesised mechanisms of action, specifying expected outcomes, and identifying the determinants that must be targeted, theory-based design increases the likelihood that interventions will be effective, replicable, and transferable (Prestwich et al., 2014). In contrast, interventions that lack a theoretical foundation often fail to specify their "active ingredients," making it difficult to evaluate, replicate, or scale them (MRC, 2008).

Importantly, theory also enhances the external relevance of interventions. By situating behaviour within wider psychological, social, and environmental systems, theories help intervention developers to anticipate barriers, identify enabling conditions, and align intervention strategies with the contexts in which they will be delivered (Kislov et al., 2019). This is particularly important in the field of SP, where interventions must account for layered determinants across individual, community, and environmental levels.

2.4.1 *Define behaviour change interventions*

Health behaviour change interventions (HBCIs) can be understood as coordinated sets of strategies designed to positively influence individual or group behaviours in order to improve health outcomes (Michie, van Stralen, & West, 2011; O'Cathain et al., 2019). These interventions are inherently complex: they often involve multiple interacting components, must address different behaviours simultaneously, and operate across diverse social and environmental contexts (O'Cathain et al., 2019). Their complexity does not simply arise from the number of components involved but from the requirement that they be tailored to sociocultural, organisational, and environmental conditions. HBCIs are widely employed in public health to promote healthier lifestyles, reduce risk-related behaviours, and enhance engagement with health services (Michie, van Stralen, & West, 2011). In doing so, they play a vital role in both the prevention and management of NCDs, making them central to contemporary strategies for reducing health inequalities.

For the purposes of this thesis, which focuses on socially prescribed, NBIs, the definition of HBCIs highlights the need for designs that are not only behaviourally targeted but also context-sensitive and responsive to wider determinants of health.

2.4.2 *Benefits of using theory to design and implement interventions*

The use of theory in intervention design addresses common weaknesses in practice by providing a systematic means of linking determinants to strategies. As O'Cathain et al. (2019) emphasise, theory clarifies what is both important and feasible when setting intervention goals, content, and delivery. It also provides a rationale for why an intervention should work, supporting stronger evaluation and enabling cumulative knowledge development across studies (Davidoff et al., 2015; Kislov et al., 2019).

Different types of theory contribute distinct benefits. Explanatory theories identify why behaviours occur. For example, SCT (Bandura, 1986, 2001) and the HBM (Rosenstock, 1974; Rosenstock et al., 1988) focus on psychological and social processes such as self-efficacy, modelling, and perceptions of risk and benefit. In addition, theories from environmental psychology, such as ART (Kaplan & Kaplan, 1989) and SRT (Ulrich, 1991), offer further explanatory scope by highlighting the health-promoting properties of natural environments. These will be examined in more detail later in this chapter.

Applied behavioural models and frameworks provide ways to organise these theoretical insights into structured categories. The COM-B model (Michie, van Stralen, & West, 2011), and its extension within the Behaviour Change Wheel (BCW) (Michie, Atkins, & West, 2014), offers a parsimonious framework for behavioural diagnosis, classifying determinants under Capability, Opportunity, and Motivation and linking them to intervention functions and policy categories. The TDF (Cane et al., 2012) extends this approach by synthesising 33 theories into 14 domains, enabling more detailed identification of behavioural determinants. These applied frameworks, and their relationship to IM, are discussed in detail in Section 2.8.

Finally, planning frameworks such as IM (Bartholomew Eldredge et al., 2016) provide a structured, stepwise process that integrates evidence, theory, and stakeholder perspectives. IM requires the explicit specification of change objectives and their mapping to theoretical methods, ensuring transparency and coherence across the development cycle.

For this thesis, such a layered use of theory was essential for operationalising the BPS model of health (Engel, 1977; Wade & Halligan, 2017). By integrating psychological, social, and environmental perspectives, the intervention design process was explicitly aligned with the BPS model, ensuring that determinants across all three domains were addressed.

2.5 Intervention Development Frameworks

Designing effective behaviour change interventions, particularly for lifestyle-related conditions, requires structured approaches that combine theory, empirical evidence, and stakeholder perspectives. Over the past two decades, several frameworks have been developed to guide researchers and practitioners through this process. These include the MRC framework for complex interventions (MRC, 2000; Skivington et al., 2021), the Six Steps in Quality Intervention Development (6SQuID) (Wight et al., 2016), and IM (Bartholomew Eldredge et al., 2016). Each offers a different balance between conceptual breadth and operational specificity, and reviewing their respective contributions is essential for understanding why IM was ultimately adopted in this thesis.

2.5.1 *Intervention Mapping Approach*

IM is a comprehensive, systematic framework for developing theory- and evidence-based health promotion programs and other behavioural interventions. Originally developed by Bartholomew Eldredge and colleagues, the IM approach provides a structured pathway that guides planners from the initial problem identification phase through to the design, implementation, and evaluation of interventions (Bartholomew Eldredge et al., 2016). Its strength lies in its detailed stepwise process, which incorporates theoretical models of behaviour change, empirical evidence, stakeholder input, and ecological perspectives to address both individual and environmental determinants of behaviour (Kok et al., 2016; Peters et al., 2015).

The IM framework is composed of six iterative steps: (1) conducting a needs assessment to understand the health problem and its determinants; (2) creating matrices of change objectives that link behavioural and environmental outcomes to their determinants;

(3) selecting theory-informed intervention methods and practical applications; (4) organising these methods and applications into coherent programme components and materials; (5) planning for programme adoption, implementation, and sustainability; and (6) developing an evaluation plan to assess both the process and outcomes of the intervention (Bartholomew Eldredge et al., 2016; Fernandez et al., 2019). This systematic process encourages a clear logic model of change and ensures that each stage of development is grounded in both theory and empirical research.

One of the distinguishing features of IM is its emphasis on transparency and rigour in intervention development. Unlike more heuristic or less structured approaches, IM requires developers to explicitly document the rationale for each decision, making the process replicable and adaptable to other contexts (Fernandez et al., 2019; O'Cathain et al., 2019). Furthermore, it incorporates a participatory approach, encouraging collaboration with stakeholders, including the target population, throughout the design process to enhance relevance, feasibility, and uptake (Fernandez et al., 2019; Peters et al., 2015).

Although IM has been critiqued for being resource and time-intensive, requiring substantial expertise, data, and stakeholder engagement to implement fully (Fernandez et al., 2019; Peters & Kok, 2016), these demands were considered acceptable for the aims and scope of this thesis. The systematic and transparent nature of IM outweighed these challenges, providing the necessary structure for developing an intervention that was both evidence-informed and contextually sensitive.

In a review of intervention design approaches, O'Cathain et al. (2019) analysed a variety of frameworks and highlighted that IM was among the most comprehensive. It was uniquely positioned in that it systematically integrated theoretical constructs with practical strategies while also addressing both personal and environmental factors that influence behaviour. Importantly, it was noted to contain the most actionable and clearly articulated steps, which greatly facilitates the translation of theory into practice and supports the development of robust, well-structured interventions.

Because of its methodical nature and theoretical robustness, IM has been widely applied in public health, education, and clinical settings for addressing complex health and social issues. Applications include the design of school-based nutrition programmes to prevent childhood obesity (Buijs et al., 2019), stroke activation interventions (Volevach et al., 2024), occupational health programmes (Verweij et al., 2013), and chronic disease management strategies (Fernandez et al., 2014). These examples highlight IM’s adaptability across diverse contexts and its effectiveness in ensuring that interventions are tailored to the needs of specific populations, thus increasing their likelihood of sustainability (Kok et al., 2016; Peters et al., 2015).

Integral to the IM framework is its taxonomy of behaviour change methods, which catalogues theory- and evidence-based techniques and specifies the parameters required for their effective use (Kok et al., 2016). This taxonomy extends the practical utility of IM by translating theoretical constructs into actionable methods such as modelling, persuasion, or facilitation, and by outlining the conditions under which each method is most likely to achieve change. In doing so, it bridges the gap between behavioural diagnosis and intervention design, providing a structured link between determinants and implementation strategies. While the taxonomy forms part of the broader IM process rather than a standalone framework, its emphasis on theoretical precision and practical applicability makes it central to the intervention design approach adopted in this thesis. The complementary use of the IM taxonomy alongside the Theoretical Domains Framework (TDF) is discussed further in Section 2.8.

2.5.2 Medical Research Council Framework (MRC)

The Medical RC (MRC) Framework for the development and evaluation of complex interventions was originally published in 2000 as a response to the growing need for structured guidance in public health and health services research (MRC, 2000). Its primary aim was to support researchers and funders in designing, evaluating, and implementing effective health interventions by outlining appropriate methodological choices across the research lifecycle. The framework emphasised the complexity inherent in many health interventions, arising from multiple interacting components, behaviours, outcomes, and contextual factors, and encouraged a more systematic and transparent approach to intervention development.

The framework was later updated and refined in response to feedback and emerging research, culminating in the most recent guidance published by Skivington et al. (2021). This updated version of the MRC Framework places greater emphasis on understanding context, stakeholder engagement, and the dynamic, iterative nature of intervention development. It is structured around four non-linear and overlapping phases: development or identification of the intervention, feasibility testing, evaluation, and implementation. Each phase is associated with specific core elements, such as defining and refining intervention components, assessing acceptability and practicality, measuring effectiveness, and understanding how to scale up interventions in real-world settings. Importantly, the framework allows developers to enter at any stage and to move iteratively through the process, acknowledging that intervention development is rarely linear (Skivington et al., 2021).

While the MRC Framework has played a pivotal role in shaping how complex interventions are approached in research, it has also been subject to critique, particularly regarding its level of prescriptiveness. O’Cathain et al. (2019) argue that the framework, although conceptually useful, can lack the level of operational detail needed to guide researchers through the actual process of developing interventions. Its high-level nature may be too abstract for those seeking concrete, actionable steps, especially when dealing with multifaceted health problems that require intricate behaviour change strategies, detailed logic models, and integration of theory, evidence, and stakeholder insight.

This perceived lack of specificity and hands-on guidance was a key reason why IM was selected as the primary framework for this thesis. IM offers a far more detailed, stepwise process that explicitly links each stage of intervention development with theory-based methods and empirical evidence, while also embedding stakeholder engagement and contextual analysis throughout the process (Bartholomew Eldridge et al., 2016), something vital for the development of NBIs in SP. Unlike the MRC Framework, which outlines what should be considered, IM provides structured guidance on how to do it, through its six distinct steps ranging from needs assessment to evaluation planning. This procedural depth allows for greater transparency, reproducibility, and adaptability when designing interventions aimed at addressing complex public health issues.

Thus, while the MRC Framework remains a foundational tool for conceptualising and guiding the development of complex interventions, the adoption of IM in this research reflects a desire for a more granular, theory-informed, and participatory approach better suited to operationalising complexity in intervention design.

2.5.3 6SQuID: Six Steps in Quality Intervention Development

The Six Steps in Quality Intervention Development (6SQuID) model (Wight et al., 2016) was also considered as an alternative framework. Developed as a pragmatic tool for public health teams, 6SQuID condenses intervention development into six sequential steps: defining the problem, identifying modifiable causal factors, clarifying the mechanisms of change, selecting delivery methods, testing and refining, and planning for implementation and evaluation. Its appeal lies in its accessibility and straightforwardness. For teams working with limited resources, 6SQuID offers a simple structure that ensures interventions are at least minimally grounded in evidence and logic.

Despite these strengths, 6SQuID was not adopted in this thesis due to its parsimony, where, while valuable in some contexts, is also its greatest limitation. The framework does not provide detailed guidance on how to translate determinants into change objectives or link them with evidence-based behaviour change methods. Nor does it explicitly incorporate a mechanism for integrating multiple theoretical perspectives, which was essential for this research given its interdisciplinary scope. In the context of SP, where interventions must address determinants across psychological, social, and environmental levels, greater theoretical precision was required.

Therefore, while 6SQuID was useful to review and provided helpful clarity on the importance of early problem definition and mechanisms of change, it did not meet the needs of this thesis. IM was selected, as it combines structure with theoretical depth, enabling the systematic integration of multiple theories and empirical insights into a transparent, replicable development process (Bartholomew Eldredge et al., 2016; Kok et al., 2016).

2.6 Justification for Selecting Intervention Mapping (IM)

Of the frameworks reviewed, IM (Bartholomew Eldredge et al., 2016) was selected as the most appropriate for this thesis and its applicability to NBI's and SP. Unlike the MRC framework, which offers high-level conceptual guidance but little operational detail (Skivington et al., 2021), IM provides a structured, end-to-end process that explicitly links needs assessment to theory-informed change methods and evaluation planning. Compared with 6SQuID (Wight et al., 2016), IM offers far greater depth, enabling the development of matrices of change objectives and the systematic mapping of behavioural determinants to intervention strategies.

Crucially, IM is designed to integrate multiple theoretical perspectives, empirical evidence, and stakeholder insights, ensuring that interventions are both evidence-based and contextually responsive (Kok et al., 2016; Peters & Kok, 2016). This was particularly important in the case of socially prescribed, NBIs, which must be sensitive to lived experience, community settings, and delivery constraints. IMs structured and participatory ethos therefore aligned well with the co-production principles of SP, while offering the transparency and rigour required to support replicability. For these reasons, IM was selected as the core framework guiding intervention development in this thesis.

2.7 Theories and frameworks underpinning the IM approach

The integration of theory into behaviour change intervention (BCI) design is crucial for ensuring that interventions are systematic, evidence-informed, and targeted at key determinants of behaviour. Theory provides a conceptual scaffold for understanding why behaviours occur and how they can be influenced. It allows intervention developers to specify mechanisms of change, match them to intervention functions, and predict potential outcomes. As Davidoff et al. (2015) and Prestwich et al. (2014) argue, theory-based interventions are more likely to be effective, replicable, and transferable than those developed intuitively.

The explanatory theories selected for this thesis were chosen to reflect and operationalise the three domains of the BPS model. The SCT and the HBM address psychological and social processes, while ART and SRT highlight environmental influences with biological and affective consequences. Together, these theories provide complementary insights consistent with the BPS understanding of health as the product of interacting biological, psychological, and social processes.

To support a broad, integrative understanding of behavioural determinants, this thesis also employs the TDF (Cane et al., 2012). The TDF is not a theory itself but a synthesis of 33 behaviour change theories, organised into 14 domains such as knowledge, skills, beliefs about capabilities, social influences, and environmental context. Its strength lies in providing a systematic, theory-informed structure for analysing barriers and enablers of behaviour, particularly from qualitative data (Atkins et al., 2017; Francis et al., 2012).

While IM already guides developers to identify behavioural determinants and link them to theory-based change methods (Bartholomew Eldredge et al., 2016; Kok et al., 2016), the process does not prescribe how determinants should be comprehensively identified. Here, TDF adds value: it provides a validated framework that minimises the risk of overlooking key influences and allows determinants to be transparently mapped back to established theoretical constructs (Cane et al., 2012; Michie et al., 2014). In this way, TDF complements IM by strengthening the early steps of needs assessment and matrix development, before behaviour change methods are selected.

Although only a small number of studies have used TDF and IM in combination, there is growing precedent for their integration. For example, van Agteren et al. (2021) used TDF to guide the identification of behavioural determinants within the IM process when developing the Be Well Plan mental health intervention. In their approach, TDF was applied during the needs assessment phase to ensure determinants were comprehensive and theory-informed, and IM then provided the pathway from determinants to behaviour change techniques and practical strategies. This illustrates how the two frameworks can be complementary: TDF strengthens the identification of determinants, while IM ensures systematic translation into intervention components (French et al., 2012; Presseau et al., 2019).

Within this thesis, individual theories such as SCT (Bandura, 1986, 2001) and the HBM (Rosenstock, 1974) are also discussed because they inform specific constructs central to NBSPs, such as self-efficacy, social modelling, and health risk perception. These theories contribute explanatory depth by clarifying psychological and social mechanisms, while environmental psychology theories such as ART (Kaplan & Kaplan, 1989) and SRT (Ulrich, 1991) extend this scope by highlighting the restorative and stress-reducing properties of natural settings. Taken together, these explanatory theories provide complementary insights into the psychological, social, and environmental determinants of engagement with NBSPs.

To move from theory to application, this thesis employed the TDF (Cane et al., 2012), which consolidates constructs from multiple theories into a practical tool for intervention design within IM. The TDF is introduced in Section 2.8, where its role in structuring behavioural determinants and supporting systematic translation into intervention strategies is discussed in detail.

2.7.1 *Social Cognitive Theory (SCT)*

SCT, developed by Bandura (1986), presents a dynamic and agentic understanding of human behaviour, viewing individuals as both products and producers of their environment. Central to SCT is the principle of reciprocal determinism, the concept that personal factors, behavioural patterns, and environmental influences interact continuously to shape behaviour over time. This framework is particularly relevant in the context of nature-based SP, where individual action is shaped not only by motivation and beliefs but also by access to supportive environments, social norms, and external reinforcement structures (Bandura, 2001).

A defining construct within SCT is self-efficacy, referring to a person's belief in their ability to perform a specific behaviour successfully (Bandura, 1997). High self-efficacy is consistently associated with greater perseverance, confidence, and resilience in adopting and maintaining health behaviours, particularly in the face of challenges or unfamiliar settings (Beauchamp at al., 2019). In the context of this thesis, self-efficacy is essential to understanding whether individuals feel confident engaging with NBSPs, which are often non-traditional, under-promoted, or perceived as inaccessible by those unfamiliar with them.

SCT also incorporates key constructs such as observational learning, outcome expectancies, behavioural reinforcement, and self-regulation. Observational learning, or learning through modelling, is especially relevant in socially prescribed community interventions, where individuals often draw motivation from peers, group leaders, or practitioners who demonstrate health-promoting behaviours (Southby et al., 2021). Outcome expectancies describe the anticipated consequences of a given behaviour, influencing whether individuals perceive the effort of change as worthwhile. Reinforcement, both intrinsic and extrinsic, serves as a feedback mechanism that shapes future behaviour based on rewards, social approval, or positive health outcomes (Bandura, 2001).

When mapped onto the TDF, SCT contributes to several key domains:

- Beliefs about capabilities, such as self-efficacy
- Social influences, including peer modelling and group norms
- Reinforcement, through rewards and environmental feedback
- Behavioural regulation, including goal setting and planning
- Knowledge, including awareness of health risks and benefits

This wide scope makes SCT a highly appropriate theoretical model for health interventions that operate at the intersection of individual, social, and environmental determinants. It allows researchers and practitioners to account for both structural and psychological barriers to behaviour change and to design strategies that address them simultaneously (Bandura, 1986, 2001).

Moreover, SCT introduces the concept of interpersonal agency, in which others, such as link workers, healthcare providers, or community leaders, act as enablers by supporting individuals through external guidance, access, and encouragement. This concept is particularly applicable to SP, where engagement is often facilitated through structured support and relational trust (Kirmayer and Gómez-Carrillo, 2019). The theory also accommodates structural barriers, acknowledging that health behaviours are not formed in a vacuum but shaped by the availability of resources, time, and social support systems.

For these reasons, SCT was selected as a core theoretical model for this thesis. SCT informed the development of key outcomes and change objectives, particularly through its emphasis on self-efficacy, observational learning, and behavioural reinforcement (Bandura, 1986, 2001). These constructs were directly relevant to intervention components such as modelling, goal setting, and building confidence in engaging with NBIs. The HBM was also drawn upon to shape objectives related to health risk perception and the perceived benefits of behaviour change (Rosenstock, 1974).

While SCT and HBM highlight specific mechanisms of behaviour change, the TDF was used alongside IM to provide a broader, synthesised structure for identifying determinants across multiple theories. In this way, SCT and HBM contributed targeted explanatory insights, while TDF ensured a comprehensive and systematic categorisation of behavioural determinants that could be mapped into the IM process.

2.7.2 *Health Belief Model (HBM)*

The HBM, developed by Rosenstock (1974) and later expanded by Becker and Maiman (1975), is one of the earliest and most influential models in health psychology.

Originally designed to explain why individuals fail to engage in preventative health behaviours such as screening and vaccination, HBM remains widely used in interventions targeting risk-related lifestyle behaviours, particularly in public health contexts (Carpenter, 2010).

The model posits that individuals are more likely to take health-related action when the following six conditions are met:

1. They perceive themselves to be susceptible to a health threat (perceived susceptibility),
2. They believe the condition would have serious consequences if left unaddressed (perceived severity),
3. They believe the benefits of taking preventive action outweigh the costs or difficulties (perceived benefits),
4. They recognise and feel able to overcome potential obstacles (perceived barriers),
5. They are prompted to act by external or internal triggers (cues to action),
6. They believe they are capable of taking effective action (self-efficacy, added in later refinements by Rosenstock et al., 1988).

These constructs align with the TDF across several domains:

- Beliefs about consequences, including perceived risk and benefits
- Beliefs about capabilities, including self-efficacy
- Environmental context and resources, related to perceived barriers
- Memory, attention, and decision-making processes, influenced by cues to action

HBM is especially valuable in the context of this thesis, as it provides a clear framework for understanding how perceptions of health risk, personal vulnerability, and the perceived value of preventative actions influence behaviour. This is particularly pertinent for individuals at risk of NCDs, who may underestimate the seriousness of their condition or remain unaware of the benefits of preventative, non-clinical approaches such as NBSPS (Dean and Soderlund, 2015).

Cues to action are also highly relevant in SP contexts, where practitioner guidance, peer encouragement, or digital prompts may act as behavioural catalysts. In many cases, individuals require these nudges to shift from contemplation to action, particularly when the prescribed intervention is unfamiliar, informal, or perceived as optional rather than essential (Chatterjee et al., 2018).

The model's inclusion of self-efficacy in later iterations strengthened its utility, enabling it to account for the confidence individuals need to undertake behaviour change, particularly in environments where health literacy, social support, or environmental access may be limited (Rosenstock et al., 1988). However, HBM has also been criticised for assuming linear, rational decision-making processes, and for underestimating the role of habit, emotion, and social context in shaping behaviour (Bartholomew Eldredge et al., 2016; Kelly and Barker, 2016).

To mitigate these limitations, this thesis integrates HBM with SCT. The two models are highly complementary, with SCT offering a more dynamic understanding of agency, social learning, and environmental interaction, and HBM providing structured insight into how individuals assess health risk, benefits, and personal readiness for action. Together, they provide a robust, multi-level framework for designing interventions that are both theoretically grounded and practically responsive to the lived experiences of socially prescribed participants. In addition to SCT and HBM, several other theoretical models were considered for their potential contribution to the intervention design. These include the Transtheoretical Model, the Theory of Planned Behaviour, and SDT. While each offers valuable insights into behaviour change processes, they were excluded from primary use due to contextual or conceptual limitations, as detailed below

2.7.3 *Transtheoretical Model (TTM)*

The TTM (Prochaska & DiClemente, 1983) models behaviour change as a progression through five stages from precontemplation to maintenance and has demonstrated utility in smoking cessation and physical activity research. However, its stage-based structure has been criticised for being overly linear and for focusing primarily on individual-level cognitive readiness, offering limited explanatory power for the social, structural, and environmental determinants central to SP engagement — such as access to green space, peer influence, and link worker support (Bandura, 2001; Bickerdike et al., 2017; Sutton, 2000). For these reasons, SCT was selected in its place, as it offers the relational and ecological depth that TTM lacks.

2.7.4 *Theory of Planned Behaviour (TPB)*

The TPB (Ajzen, 1991) predicts behavioural intention through attitudes, subjective norms, and perceived behavioural control. While it has strong predictive utility in cross-sectional research, its focus on intention formation has been criticised for limited capacity to explain the transition from intention to sustained behaviour, particularly in complex community settings (Sniehotta et al., 2014). It also underemphasises the post-intentional processes of habit formation, environmental facilitation, and social reinforcement that are central to NBSP engagement. SCT was therefore selected as a more comprehensive alternative that better accounts for these ongoing, contextually embedded processes.

2.7.5 *Self-Determination Theory (SDT)*

SDT (Deci & Ryan, 1985, 2000) explains sustained behaviour through the fulfilment of three basic psychological needs, autonomy, competence, and relatedness, and has been widely applied to long-term engagement in health contexts (Ng et al., 2012). However, its primary focus on maintenance rather than initial adoption means it offers limited guidance on the early-stage motivational processes, such as perceived health threat, social persuasion, and behavioural modelling, that are particularly relevant for individuals unfamiliar with SP or community-based activities. Additionally, SDT's emphasis on internal motivation can underestimate the importance of the external scaffolding (link workers, peer groups, structured environments) through which SP engagement is typically initiated. SCT, with its treatment of reciprocal determinism, social modelling, and environmental shaping, provided the broader and more contextually sensitive explanatory power required for this thesis.

2.8 Applied behaviour change models and frameworks: COM-B, BCW, TDF and IM

Alongside overarching theories of behaviour change, this thesis considered applied models and frameworks that could structure the analysis of behavioural determinants and inform the selection of change strategies within the Intervention Mapping (IM) process. The frameworks reviewed include the COM-B model, the Behaviour Change Wheel (BCW), the Theoretical Domains Framework (TDF), and the IM taxonomy of behaviour change methods. Related classification systems, the Behaviour Change Technique taxonomy (BCTTv1) and the Behaviour Change Intervention Ontology (BCIO), are also briefly discussed to situate these approaches within the wider behaviour change literature.

2.8.1 *COM-B and the Behaviour Change Wheel (BCW)*

The COM-B model (Capability, Opportunity, Motivation → Behaviour) proposes that behaviour arises from the interaction of three core components: capability (the psychological and physical capacity to engage in a behaviour), opportunity (the social and environmental conditions that enable or constrain it), and motivation (the reflective and automatic processes that direct behaviour) (Michie, van Stralen, & West, 2011). Its simplicity and flexibility have made COM-B one of the most widely used starting points for behavioural diagnosis across public-health and clinical contexts.

COM-B forms the core of the Behaviour Change Wheel (BCW) (Michie, Atkins, & West, 2014), a comprehensive framework that connects behavioural diagnosis to both intervention functions (e.g., education, persuasion, enablement) and policy categories (e.g., regulation, service provision). Once a behaviour is analysed using COM-B, the BCW provides structured guidance for selecting suitable intervention functions and policy levers to address identified capability, opportunity, or motivation deficits.

Within the BCW, specific intervention techniques are typically operationalised using the Behaviour Change Technique taxonomy (BCTTv1; Michie et al., 2013) or its more recent extension, the Behaviour Change Intervention Ontology (BCIO; Michie et al., 2020). These systems provide standardised vocabularies for describing the “active ingredients” of interventions and have greatly improved consistency and transparency in behavioural science. However, they are primarily descriptive tools, intended to classify and code existing interventions, rather than frameworks that guide the systematic development of new ones.

The BCW also explicitly links with the Theoretical Domains Framework (TDF), which provides a more detailed elaboration of COM-B’s three components (Michie et al., 2014). The TDF expands each element of COM-B into specific theoretical domains—for example, “Capability” includes domains such as knowledge, skills, and behavioural regulation; “Opportunity” includes social influences and environmental context; and “Motivation” includes beliefs about capabilities, beliefs about consequences, reinforcement, and emotion. This integration enables developers to move from high-level behavioural diagnosis (COM-B) to fine-grained analysis of determinants (TDF), supporting more precise intervention design.

While COM-B and the BCW offer accessible and widely applicable frameworks, their parsimony can limit specificity in complex, multi-determinant contexts such as social prescribing. To achieve the level of granularity required within the Intervention Mapping (IM) process, additional frameworks were reviewed that provide more detailed taxonomies of behavioural determinants and corresponding change methods.

2.8.2 *Theoretical Domains Framework (TDF) and the IM taxonomy of behaviour change methods*

The Theoretical Domains Framework (TDF) was developed to address the challenge of theory fragmentation in behaviour change research, where the proliferation of models and constructs made it difficult to apply theory consistently in applied settings. By synthesising constructs from 33 psychological and behavioural theories into 14 domains, the TDF provides a comprehensive structure for identifying cognitive, affective, social, and environmental determinants of behaviour (Cane et al., 2012). These domains encompass influences such as knowledge, skills, social/professional role and identity, beliefs about capabilities, beliefs about consequences, reinforcement, emotion, social influences, and environmental context and resources.

The TDF was initially developed to support implementation research in healthcare, where interventions often fail because the psychological and organisational determinants of professional behaviour are poorly understood (Atkins et al., 2017). Since then, it has been widely adopted in health psychology and public health to guide qualitative analysis, inform survey development, and identify barriers and enablers to intervention uptake (Francis et al., 2012; Presseau et al., 2019). Its explicit mapping to the COM-B model enhances its practical utility, enabling systematic progression from behavioural diagnosis (via COM-B) to intervention development through the BCW (Michie et al., 2014).

However, while the TDF provides a robust structure for identifying what needs to change, it does not specify how change can be achieved. To operationalise these determinants within the IM process, this thesis also incorporated the Intervention Mapping

(IM) taxonomy of behaviour change methods (Kok et al., 2016). Building on the IM framework, this taxonomy catalogues theory-linked methods, such as modelling, persuasion, facilitation, and goal setting, and specifies parameters for their effective use, that is, the conditions under which a given method can produce change.

This explicit linkage between determinants, theoretical constructs, and practical methods distinguishes the IM taxonomy from both the BCT taxonomy and BCIO, which focus on describing existing interventions rather than guiding the development of new ones. Kok and colleagues (2016) also caution that classification systems such as BCTTv1 may include techniques that are theoretically inconsistent or lack defined conditions for effectiveness. The IM taxonomy was therefore prioritised in this thesis, as it provides a more systematic and theory-driven mechanism for linking determinants to actionable strategies within complex interventions.

The TDF is not without critique. Some authors caution that its breadth can lead to descriptive rather than explanatory application, particularly when researchers “tick off” domains without deeper theoretical reflection (Atkins et al., 2017; Cane et al., 2012). Others note that it requires careful operationalisation to avoid conceptual overlap between domains. Nevertheless, the TDF remains one of the most widely used and validated tools for ensuring comprehensive identification of behavioural determinants and has increasingly been employed alongside IM in intervention development (French et al., 2012; Presseau et al., 2019).

2.8.3 *Rationale for using TDF and IM taxonomy*

The frameworks reviewed, COM-B, BCW, TDF, BCT, BCIO, and the IM taxonomy, represent overlapping but complementary approaches to understanding and changing behaviour. COM-B offers a concise model of the core conditions for behaviour (Capability, Opportunity, Motivation → Behaviour), and the BCW extends this by linking behavioural diagnosis to intervention and policy functions (Michie et al., 2011, 2014). The TDF expands the diagnostic precision of COM-B by unpacking each component into 14 theoretically derived domains that capture a wider range of cognitive, emotional, social, and environmental determinants of behaviour (Cane et al., 2012).

Although COM-B was reviewed as a potential framework for this thesis, it was not used directly. COM-B and the BCW were valuable for framing the initial understanding of behaviour, but their broad categories were insufficient for the level of analytical precision required within the IM. The TDF, which elaborates COM-B's components into detailed behavioural domains, provided the granularity needed to identify and organise determinants derived from the qualitative needs assessment.

To operationalise these determinants within the IM process, the IM taxonomy of behaviour change methods (Kok et al., 2016) was used to link each determinant to corresponding evidence-based methods and practical applications. This integration addressed a recognised limitation of IM, its limited taxonomic specification of behavioural determinants (Fernández et al., 2019) and ensured theoretical transparency throughout the design process. Unlike the Behaviour Change Technique taxonomy (BCTTv1; Michie et al., 2013) and the Behaviour Change Intervention Ontology (BCIO; Michie et al., 2020), which focus primarily on classifying existing intervention content, the IM taxonomy supports systematic design by defining parameters for the effective application of behaviour change methods.

The combined use of the TDF and IM taxonomy is increasingly reflected in complex intervention research, where it enables comprehensive behavioural diagnosis alongside rigorous method selection (French et al., 2012; Presseau et al., 2019; van Agteren et al., 2021). In the context of nature-based social prescribing (NBSP), where behavioural influences operate across biological, psychological, and social domains, this integration was particularly advantageous. The TDF captured the nuanced psychological and contextual factors influencing engagement, while the IM taxonomy guided the selection of theory-based methods to address them.

Together, these frameworks provided a coherent, theory-informed foundation for intervention development, ensuring that the strategies proposed in this thesis were both conceptually robust and practically relevant. In summary, this thesis reviewed, and critically appraised key applied behaviour change frameworks, including COM-B, the BCW, the TDF, and the IM taxonomy of behaviour change methods. While COM-B and the BCW provided a useful conceptual foundation for understanding behavioural influences, the combination of TDF and the IM taxonomy offered the necessary analytical precision and theoretical transparency for this study’s aims. The TDF ensured comprehensive identification and categorisation of behavioural determinants, while the IM taxonomy enabled systematic translation of these determinants into evidence-based methods and practical strategies.

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2.9 The Role of Agency in HBC: Implications for Intervention Design

Building on the behaviour change frameworks discussed in the preceding section, the concept of agency provides an essential bridge between individual-level psychological determinants and the broader social and structural contexts in which behaviour occurs. While models such as COM-B, the TDF, and the IM taxonomy focus on identifying and addressing factors that influence behaviour, the notion of agency extends this analysis by emphasising individuals' capacity to act intentionally within enabling or constraining environments. In the context of social prescribing, and particularly nature-based social prescribing (NBSP), agency offers a unifying construct that captures both personal agency (the ability to make and enact choices), proxy agency (reliance on others to act on one's behalf, such as link workers or healthcare providers), and collective agency (the shared capacity of groups or communities to bring about change). Examining agency therefore deepens the theoretical foundation established by behaviour change models by situating individual motivation and self-efficacy within a relational and ecological perspective that aligns with the biopsychosocial model of health.

As discussed in Chapter 1, agency is a central construct in understanding engagement with nature-based SP. Building on Bandura's (1986, 2001) conceptualisation of personal, proxy, and collective agency, this section focuses on the practical implications of these forms of agency for intervention design within behaviour change contexts.

Within the logic model developed in this thesis, agency is not treated as a fixed trait but as a dynamic capability that can be strengthened through appropriately structured support. Behaviour change theories such as SCT (Bandura, 2001) and the HBM (Rosenstock, 1974; Rosenstock et al., 1988), contribute to understanding how interventions can enable and reinforce agency. These theories inform the mapping of behavioural determinants (e.g., self-efficacy, autonomy, perceived benefits) to intervention strategies aimed at enhancing both individual and collective capacity for change.

The design of NBIs should reflect this layered understanding of agency. For example, self-monitoring tools and goal setting can support personal agency by building self-efficacy and autonomy. Facilitated referrals and motivational interviewing (MI) serve as mechanisms of proxy agency, enabling individuals to take initial steps toward change with guided support. Group-based activities such as walks or gardening create opportunities for collective agency, reinforcing motivation through shared experience and social modelling.

By embedding these dimensions of agency into the IM process, strategies can be tailored to meet individuals where they are, while scaffolding their progression from supported to self-directed engagement. In this way, agency becomes both a guiding principle and a practical outcome of effective intervention design.

2.10 Nature and the Development of Agency

Natural environments not only promote health and wellbeing but also play a pivotal role in supporting the development of agency (Gjelvik et al., 2024). Theories from environmental psychology offer insights into how nature enhances individuals’ cognitive and emotional capacity to act, while the structure of NBIs can support the transition from externally guided to self-directed engagement.

ART suggests that natural environments promote the recovery of directed attention by engaging involuntary attention in a soft, effortless way, which in turn supports reflection, planning, and self-regulation (Kaplan and Kaplan, 1989). This cognitive restoration contributes to personal agency by enhancing individuals' capacity to make intentional choices and sustain behavioural action. Similarly, SRT posits that exposure to nature elicits immediate physiological and affective benefits, such as reductions in stress and anxiety, thereby restoring emotional stability and resilience (Ulrich, 1991; Hartig et al., 2014).

These restorative effects can create the psychological conditions necessary for individuals to take action, particularly in populations experiencing mental health challenges, fatigue, or low confidence, common among those referred to SP. In this sense, natural environments act not only as a setting but as an enabler of personal agency, providing the cognitive and emotional bandwidth required for change.

NBIs also support proxy and collective agency. Structured support through SP, such as referral by healthcare professionals or facilitation by link workers, provides a form of proxy agency, in which others initiate or guide the behavioural process on the participant's behalf (Bandura, 2001). Group-based nature activities, such as walking groups or community gardening, create opportunities for collective agency by fostering shared goals, peer support, and social modelling (Garside et al., 2023; Southby et al., 2021). These interpersonal dynamics are especially valuable for individuals' facing barriers such as social isolation or lack of confidence.

Over time, nature-based SP can enable a transition between forms of agency. For example, a person may begin their journey through a referral (proxy agency), build confidence and motivation through supported group participation (collective agency), and eventually sustain independent engagement in nature (personal agency). This progression reflects a scaffolded pathway that aligns with the aims of behavioural maintenance in community health settings (Beauchamp et al., 2019).

Eco-existential perspectives further enrich this framework by suggesting that natural settings invite individuals to explore meaning, freedom, connection, and identity, factors that underpin motivation and autonomy (Passmore and Holder, 2016; Yalom, 1980). In this way, nature becomes not only a supportive environment but also a therapeutic context where participants can reconnect with a deeper sense of purpose and control.

In sum, nature contributes to behaviour change not only by promoting health but by enabling agency across multiple levels. This understanding reinforces the rationale for embedding environmental psychology into intervention design and highlights the unique role of nature-based interventions in empowering individuals through both internal restoration and social support mechanisms.

2.10.1 ***Implications for Intervention Design***

Building on this understanding, targeted intervention strategies can be developed to align with individual needs, social dynamics, and environmental contexts. In this thesis, personal, proxy, and collective forms of agency were mapped across behavioural determinants and change objectives using the TDF, which provided a structured lens for identifying psychological, social, and contextual influences on behaviour.

Within the logic model of change, agency is reflected across various performance objectives. For example:

- **Enhancing personal agency** through strategies such as self-monitoring, goal setting, and immersive nature engagement. These are supported by constructs from SCT (e.g., self-efficacy, self-regulation), ART (e.g., cognitive recovery), SRT (e.g., physiological relaxation and affective restoration), and TDF domains such as beliefs about capabilities, goals, and emotion.
- **Strengthening proxy agency** by incorporating MI, referral support, and practitioner encouragement. These reflect mechanisms from the HBM (e.g., cues to action, perceived benefits) and TDF domains such as social/professional role and identity and reinforcement.

- **Fostering collective agency** through group-based activities, peer support, and shared environmental experiences. This approach draws on SCT (e.g., observational learning, social modelling), eco-existential perspectives (e.g., meaning making in natural settings), and TDF domains such as social influences and environmental context and resources.

NBIs are uniquely positioned to support transitions between these forms of agency, from externally supported initiation to autonomous, sustained engagement. These interventions combine psychological benefits, social connection, and restorative environmental experiences, enabling participants to build confidence and internal motivation over time.

By integrating these theoretical insights into the IM process and operationalising them through the TDF, the intervention remains grounded in behavioural science while responsive to the lived realities of those engaging with nature-based SP. This layered, theory-informed approach ensures that strategies are both evidence-based and practically meaningful, enhancing the intervention's relevance, acceptability, and impact.

2.11 Environment-Health Theories

This section reviews the environmental psychology theories that inform the development of the NBIs in this thesis. Two core frameworks, ART and SRT, were selected for their empirical robustness, mechanistic clarity, and applicability to early-stage engagement in natural settings. Several additional theories, including Emotion Regulation Theory (ERT), Conditioned Restoration Theory (CRT), the Biophilia Hypothesis, and Ecopsychology, were also reviewed as key theories in the field of nature and health. While each offers valuable conceptual insights, they were not selected as core frameworks due to limitations in specificity, empirical grounding, or relevance to the structure and aims of the intervention. This section provides an overview of each theory, offering a rationale for inclusion or exclusion in the conceptual framework of the thesis.

2.11.1 *Attention Restoration Theory (ART)*

ART, developed by Kaplan and Kaplan (1989, 1995), offers a cognitive explanation for how natural environments, typically green or blue spaces that evoke a sense of being away and fascination, restore depleted attentional capacity. According to this theory, mental fatigue results from the prolonged use of directed attention, a limited cognitive resource used to focus on tasks and suppress distractions (Kaplan & Kaplan, 1989, 1995). ART proposes that natural environments promote directed attention recovery by engaging involuntary attention through soft fascination, stimuli such as rustling leaves, flowing water, or birdsong that gently hold attention without requiring cognitive effort. Directed attention refers to the deliberate, effortful focus required for tasks such as problem-solving or self-control, which can become fatigued through overuse. In contrast, involuntary attention is automatically captured by inherently interesting or pleasant stimuli and requires little mental effort (Kaplan & Kaplan, 1989). For restoration to occur, the environment must also offer a sense of being away from one’s usual setting, provide a coherent and immersive experience (extent), and be compatible with the individual’s goals or needs.

Empirical studies have shown that time spent in natural, restorative environments improves concentration, working memory, and problem-solving ability (Berman et al., 2008; Ohly et al., 2016). ART has been influential in designing interventions that incorporate mindful nature walks, reflective practices, or outdoor creative tasks, particularly for individuals experiencing cognitive fatigue, stress, or burnout (Yusli et al., 2021). Its structured environmental criteria provide actionable guidance for intervention development. Furthermore, ART aligns well with Wilkie and Davinson’s (2021) emphasis on the situated nature of greenspace experiences by acknowledging that restorative effects depend not just on “nature” as a concept but on the interaction between individual states and environmental features.

2.11.2 *Stress Reduction Theory (SRT)*

SRT, originally introduced by Ulrich (1983) and further developed by Ulrich et al. (1991), proposes that exposure to unthreatening natural environments, that is, settings perceived as safe, open, and non-threatening, elicits immediate positive emotional responses and reduces physiological stress. These responses are evolutionarily adaptive, stemming from humans’ historical reliance on natural settings for survival. Examples include calm, green spaces such as parks, woodlands, or areas with open views and gentle water features, which tend to evoke feelings of safety and relaxation rather than alertness or fear. Natural features such as open views, vegetation, and water are thought to quickly engage the parasympathetic nervous system, resulting in lowered heart rate, blood pressure, and cortisol levels (Hartig et al., 2003; Tsunetsugu et al., 2013; Ulrich et al., 1991;). These effects can occur rapidly and with minimal cognitive effort, making them particularly relevant for populations experiencing chronic stress or emotional exhaustion.

More recent studies have substantiated SRT’s claims across various populations and settings. For instance, exposure to natural scenes, both in real-life and virtual formats, has been linked to improved affect and reduced physiological arousal within minutes (Browning et al., 2020; Hunter et al., 2019). Such findings have been reinforced by neuroimaging research showing that nature exposure is associated with decreased activity in the subgenual prefrontal cortex, a region linked to rumination and mood disorders (Bratman et al., 2015).

SRT is particularly applicable to the context of SP, where participants often experience cumulative stress, that is, the combined impact of multiple and persistent stressors arising from socioeconomic hardship, chronic health conditions, or social isolation. Over time, cumulative stress can lead to dysregulation of the body's stress-response systems, including the HPA axis, increasing vulnerability to both mental and physical health problems (McEwen & Gianaros, 2010). However, it is important to distinguish SRT's scope from that of models focused on strategic emotional self-regulation. SRT describes automatic affective recovery, not the intentional management of emotional states through cognitive strategies. These more deliberate processes are better explained by emotion regulation models (Gross, 1998; Richardson et al., 2021).

2.11.3 *Emotion Regulation Theory (ERT)*

ERT (Gross, 1998, 2015) explains how individuals regulate their emotional experiences through antecedent-focused strategies such as cognitive reappraisal, and response-focused strategies such as suppression. Applied to nature-based interventions, ERT offers a useful lens for understanding how natural environments may facilitate adaptive emotion regulation, for example, the sensory qualities of a woodland setting may encourage reappraisal or attentional distraction from negative internal states (Korpela et al., 2018). Richardson et al. (2021) extended this thinking in their Emotion Regulation through Nature Engagement (ERNE) model, which links nature exposure directly to regulatory processes. However, ERT and ERNE focus primarily on what individuals do with their emotions, rather than on the environmental affordances that trigger restoration in the first place. They are therefore best understood as complementary to ART and SRT, which address the nature-specific mechanisms more directly and provide the intervention-design specificity required for this thesis.

2.11.4 *Conditioned Restoration Theory (CRT)*

CRT (Korpela & Ylén, 2007) proposes that the restorative effects of natural environments can become conditioned through associative learning: repeated pairing of a specific place with stress relief leads to automatic restorative responses upon returning to that setting, explaining why familiar green spaces sustain wellbeing over time (Scannell & Gifford, 2010). While this is a compelling account of long-term engagement, CRT assumes prior positive experience with specific natural settings, an assumption that does not hold for many SP populations who may be unfamiliar with or disengaged from greenspace. CRT is therefore more applicable as a maintenance mechanism than as a primary explanatory model for the initial outcomes this thesis addresses, and ART and SRT, which do not require prior conditioning, better suit the intervention context.

2.11.5 *Biophilia Hypothesis*

The Biophilia Hypothesis, proposed by Wilson (1984), posits that humans possess an innate affinity for the natural world, shaped by evolutionary forces that favoured responsiveness to life-sustaining environments. According to this hypothesis, natural settings evoke feelings of safety, comfort, and aesthetic pleasure because such environments historically signalled resources, shelter, and low threat. Biophilia provides a broad conceptual foundation for understanding the universal appeal of nature and its positive effects on human wellbeing.

While influential in shaping the discourse on human-nature relations, Biophilia lacks specificity regarding mechanisms of change or intervention design. It does not differentiate between types of natural environments, nor does it account for individual, cultural, or contextual variability in response to nature. As Wilkie and Davinson (2021) argue, many nature-based interventions lack theoretical clarity and fail to specify the mechanisms through which change occurs. While the Biophilia Hypothesis provides a broad conceptual rationale, its universalising assumptions risk overlooking the contextual, social, and emotional variability of greenspace experiences. This limits its practical utility for targeted, evidence-based intervention design.

2.11.6 *Ecopsychology*

Ecopsychology represents a transdisciplinary approach that integrates ecological thinking with psychology to understand the relationship between environmental and mental health (Roszak, 1992; Fisher, 2013). It posits that psychological wellbeing is inherently connected to one's relationship with the natural world, and that modern disconnection from nature contributes to mental distress (Buzzell and Chalquist, 2009; Jordan and Hinds, 2016). Ecopsychology challenges anthropocentric views of mental health by framing nature not merely as a context for healing but as a co-participant in therapeutic processes (Buzzell and Chalquist, 2009; Fisher, 2013). Its applied counterpart, Ecotherapy, involves practices such as nature-based counselling, wilderness therapy, and group outdoor experiences that aim to restore ecological identity, spiritual connection, and emotional regulation (Berger and Lahad, 2010; Jordan and Hinds, 2016).

Although Ecopsychology offers a compelling reimagining of the human–nature relationship, its emphasis on depth, transformation, and long-term ecological awareness makes it less suited to brief, structured public health interventions (Buzzell and Chalquist, 2009; Hegarty, 2010). It lacks a clearly defined framework for short-term outcomes and is often more philosophical than empirically grounded. Ecopsychology's value lies in expanding the ethical and relational scope of NBSPS, but it does not offer the mechanistic precision or behavioural focus needed for primary theoretical inclusion in this thesis.

2.12 Summary of Theory Selection

After a comprehensive review of relevant theories, ART and SRT were selected as the core theoretical frameworks for this thesis. Together, they offer a dual mechanism for understanding the psychological benefits of nature exposure: ART addresses the recovery of cognitive function through specific environmental affordances (Kaplan and Kaplan, 1989), while SRT accounts for the affective and physiological stress reduction triggered by natural settings (Hartig et al., 2003; Ulrich, 1991). Both theories are supported by a substantial evidence base (Berto, 2005; Bowler et al., 2010) and provide actionable criteria for the design and evaluation of interventions. Their relevance to participants experiencing cognitive fatigue, emotional dysregulation, or low energy makes them especially well-suited to the aims of a socially prescribed, NBI.

While other theories reviewed, such as Emotion Regulation Theory (Gross, 1998), Conditioned Restoration Theory (Korpela and Ylén, 2007), the Biophilia Hypothesis (Kellert and Wilson, 1993; Wilson, 1984), and Ecopsychology (Buzzell and Chalquist, 2009; Roszak, 1992), offer valuable conceptual or philosophical contributions, they were not selected as core models due to their limited specificity, empirical grounding, or operational utility in this context.

2.13 Integrating the Theoretical Framework

The theoretical framework developed in this thesis is not a set of parallel, independent perspectives but an integrated architecture in which each component serves a specific and complementary function. The BPS model (Engel, 1977; Wade & Halligan, 2017) provides the overarching structure, establishing that health is shaped simultaneously by biological, psychological, and social processes. This model determined the analytical scope of the thesis: it required that both individual-level psychological determinants and broader environmental and social conditions be addressed in the intervention design. Within this structure, the thesis draws on two complementary streams of explanatory theory and a paired set of diagnostic and planning frameworks to operationalise the BPS model in practice.

The first stream, behaviour change theories, addresses the question of how individuals engage with health behaviours. SCT (Bandura, 1986, 2001) explains engagement through the lens of reciprocal determinism: self-efficacy, outcome expectations, observational learning, and social reinforcement interact dynamically with environmental conditions to shape whether a person initiates and sustains a behaviour. The HBM (Rosenstock, 1974) complements this by explaining why individuals perceive health actions as necessary or worthwhile, through their appraisal of personal susceptibility, severity, benefits, barriers, and cues to action. Together, SCT and HBM map the psychological and social determinants that must be addressed for individuals to move from awareness of SP to active, sustained engagement.

The second stream, environmental psychology theories, addresses a different but related question: what properties of natural environments make them particularly conducive to the kind of psychological change that behaviour change theories require? ART (Kaplan & Kaplan, 1989) answers this by showing that natural environments restore the depleted directed attention that chronic stress and cognitive fatigue consume, the same attentional and self-regulatory capacity that SCT constructs like self-efficacy and goal setting depend upon. SRT (Ulrich, 1983) addresses the physiological dimension: rapid parasympathetic activation in natural settings reduces cortisol, heart rate, and affective arousal, creating a calmer baseline from which the perception of benefits, reduced barriers, and readiness for change, as described by the HBM, becomes more accessible. In other words, ART and SRT do not simply explain an additional outcome of NBSP; they explain the mechanism through which natural environments create the psychological and physiological conditions that make SCT- and HBM-based behaviour change more achievable. The two streams of theory are therefore mutually reinforcing: environmental theories explain why NBSPs are an effective vehicle for change, while behavioural theories explain how that change occurs at the level of the individual.

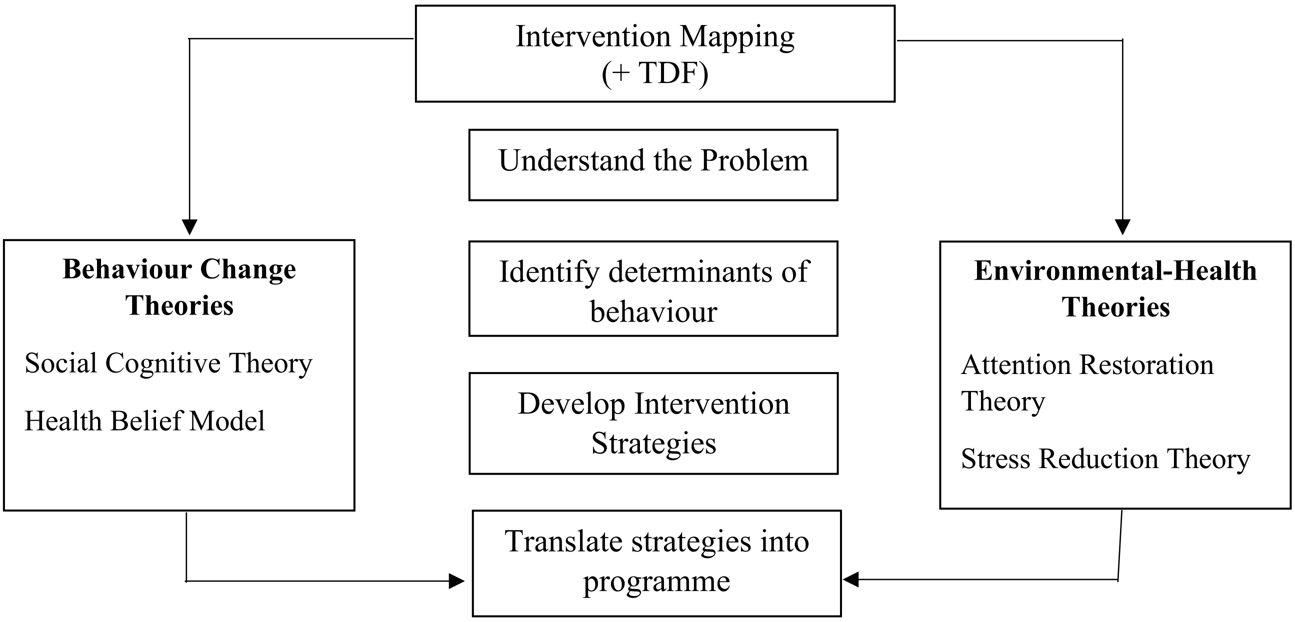
These two streams of explanatory theory are translated into intervention design through the diagnostic and planning frameworks. The TDF (Cane et al., 2012) was used to systematically identify the full range of determinants that needed to change, spanning knowledge, self-efficacy, beliefs about consequences, social influences, and environmental context, drawing primarily on the qualitative needs assessment data from Study 2 (Chapter 4). By mapping themes from that study onto TDF domains, it was possible to ensure that the intervention addressed a comprehensive and theoretically grounded set of influences, rather than only those most visible in the data. The IM framework (Bartholomew Eldredge et al., 2016) then provided the structured, six-step process through which those determinants were translated into matrices of change objectives, theory-based methods, and practical intervention components. Where TDF provided the diagnostic vocabulary for what needed to change, IM specified how to produce that change in a transparent, replicable, and stakeholder-informed way.

Critically, the interplay between these two streams of theory has direct implications for intervention design. Because ART and SRT explain that the restorative effects of nature operate rapidly, automatically, and with low cognitive demand, they suggest that NBSPs are particularly well suited to populations experiencing the kinds of psychological and social barriers that SCT and HBM identify as obstacles to engagement, low self-efficacy, high perceived barriers, limited cues to action, and reduced capacity for intentional self-regulation. Nature-based settings do not require individuals to first overcome these barriers in order to benefit; instead, exposure itself creates the conditions under which those barriers diminish. This means that the design of intervention components should exploit the automatic, low-threshold properties of natural environments to create initial engagement and then build the SCT and HBM based motivational and relational supports (modelling, cues, social reinforcement, perceived benefits) that sustain it over time. Figure 2.1 synthesises this integrated framework, showing how behaviour change and environment–health theories are mapped onto the IM process. The figure illustrates the dual role of theory in understanding the problem (e.g. barriers to access, psychological needs, and contextual constraints) and in shaping solutions, including the design of NBIs and support mechanisms. This visual synthesis should be read in conjunction with Table 2.1 (Section 2.1), which provides an at-a-glance reference to the role and location of each theoretical component across the thesis.

Together, these theoretical foundations provide a scientifically grounded pathway for embedding nature-based interventions into SP. They ensure that intervention strategies are theoretically rigorous, practically relevant, and aligned with the BPS model's emphasis on multi-level determinants of health.

Figure 2-1

Theoretical frameworks informing the thesis, situated within the overarching biopsychosocial model.



Chapter 3 Study 1: Understanding the landscape: an umbrella review of SP and nature-based interventions for NCD's

3.1 Chapter Overview

This chapter presents the first empirical phase of the thesis, addressing the need for a structured, theory-informed understanding of SP interventions for NCDs. Chapters 1 and 2 established the rising burden of NCDs and the policy and theoretical rationale for using person-centred, community-based approaches, such as SP, to support behavioural and psychosocial change. Building on this foundation, Chapter 3 applies the first stage of the IM framework: conducting a needs assessment to identify modifiable behavioural determinants and inform intervention design (Bartholomew Eldredge et al., 2016).

As outlined in Chapter 2, SP offers a mechanism for addressing behavioural risk factors, such as poor diet, physical inactivity, and social isolation, by linking individuals to non-clinical, community-based activities. These include structured exercise programmes, volunteering schemes, arts-based activities, and increasingly, NBSPs. While SP has gained traction in health policy and practice, the existing evidence remains conceptually and methodologically fragmented. Systematic reviews have documented a broad range of outcomes, but many focus on singular domains (e.g., clinical or psychological measures), use variable quality criteria, and rarely interrogate how these interventions influence behaviour (Bickerdike et al., 2017; Chatterjee et al., 2017; Husk et al., 2019).

Given the complex and multidimensional nature of SP, a broader synthesis is required, one that reflects the biopsychosocial framing adopted in this thesis (Engel, 1977) and centres on behavioural outcomes and mechanisms of change. In particular, greater clarity is needed about which health domains (biological, psychological, and social) are most influenced by SP, and how those relate to health behaviour. This is especially important in the context of IM, where intervention components must be matched to specific behavioural determinants and outcomes.

A second emerging issue, highlighted in both the literature and the stakeholder insights discussed in Chapter 2, concerns the specific value of NBSPs. Although often positioned as a distinct form of SP, NBSPs are rarely studied in direct comparison to more traditional formats. Whether they offer unique mechanisms or added benefits remains unclear.

To address these gaps, this chapter presents an umbrella review, a synthesis of systematic reviews, focused on the health-related outcomes of SP interventions for adults with, or at risk of, NCDs. The review was designed to address three key research questions:

1. What types of SP interventions have been evaluated for adults with, or at risk of, NCDs?
2. What influence do social prescriptions have on biological, psychological, and social factors influencing health behaviours?
3. What are the similarities and differences between traditional social prescriptions and nature-based interventions in their impact on health behaviour change?

These study questions are directly aligned with the overarching thesis research aims. Specifically, Study Question 1 provides a descriptive overview of the SP landscape, Study Question 2 corresponds to RQ1 of the thesis, and Study Question 3 corresponds to RQ2. The third overarching thesis question, which focuses on stakeholder perspectives, is explored in the subsequent qualitative studies (Chapters 4–6). These questions aim to consolidate what is known about the effects of SP on biopsychosocial outcomes and behavioural determinants, while also examining whether NBSPs function differently or more effectively than other SP models. In doing so, this chapter provides an empirical foundation for the qualitative inquiry that follows in Chapter 4, and for the intervention design process in Chapters 5 and 6.

3.2 Methods

An umbrella review methodology was selected to address the research questions outlined in Section 3.1. This approach was considered most appropriate because the purpose of this study was to synthesise findings from existing systematic reviews, rather than conduct a de novo review of primary studies. Alternative evidence synthesis methods were considered. A traditional systematic review was deemed unsuitable given the volume and heterogeneity of primary studies across multiple health domains, while a scoping review would not have provided the level of synthesis or critical appraisal required for Step 1 of the IM process.

Umbrella reviews are particularly suited to fields such as SP, where the evidence base is broad, heterogeneous, and growing rapidly, but often fragmented across multiple review types and outcome domains (Aromataris et al., 2015; Pollock et al., 2021). By providing a structured and transparent means of consolidating evidence at the review-of-reviews level, this method enabled a comprehensive overview of the types of SP interventions available, the biopsychosocial outcomes they influence, and comparisons between nature-based and non-nature-based formats. In this way, the umbrella review directly supports Step 1 of the IM process, providing a high-level needs assessment to inform subsequent qualitative inquiry and intervention design. The review was conducted in accordance with PRISMA 2020 guidelines for systematic reviews (Page et al., 2021) and aligned with recommendations for reviews of reviews (Smith et al., 2011). A protocol was developed in advance to guide the search strategy, inclusion criteria, and data extraction process, ensuring transparency and methodological rigour.

The overarching aim of this review was to consolidate existing evidence on the health-related outcomes of SP interventions for adults with, or at risk of, NCDs, with a specific focus on outcomes across biological, psychological, and social domains relevant to health behaviour. A secondary aim was to compare these outcomes across traditional SP models and NBSPs, where sufficient data permitted.

The remainder of this section outlines the review procedures, including the design (Section 3.2.1), eligibility criteria and search strategy (Section 3.2.2), the study selection process (Section 3.2.3), quality appraisal (Section 3.2.4), and data extraction and synthesis procedures (Sections 3.2.5 and 3.2.6).

3.2.1 *Design*

An umbrella review is a review of systematic reviews that provides a high-level overview of the existing evidence on a particular topic (Aromataris et al., 2015). This approach was selected to capture the breadth and depth of SP (SP) interventions targeting individuals with, or at risk of, NCDs. This umbrella review followed the Joanna Briggs Institute (JBI) methodology for umbrella reviews and adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) (Moher et al., 2025).

The umbrella review was structured around five core steps: (1) Introduction and rationale including the research questions (Section 1.0), (2) Methodology including inclusion criteria, search strategy, study selection, quality assessment, data collection and synthesis (Section 2.0), (3) Results (Section 3.0), (4) Summary of evidence in tabular form (Section 3.0), and (5) Discussion, conclusions, and recommendations (Section 4.0).

3.2.2 Search Strategy

The search strategy was informed by the PICO (Problem, Intervention, Context, Outcome) framework (See table 1) and previous relevant reviews (Chatterjee et al., 2017;

Tierney et al., 2020; Thomson et al., 2017). The inclusion criteria were embedded in the search process to ensure only relevant reviews were retrieved. Specifically, eligible studies had to be systematic reviews focusing on SP interventions for adults (aged 18 or older), published in English, and reporting at least one biological, psychological, social, or behavioural health outcome. Reviews focusing exclusively on pharmacological, palliative care, or mental health interventions were excluded.

Table 2

PICO Framework for the Umbrella Review of SP and Nature-Based Interventions

Component	Description
P (Population/Problem)	Adults aged 18 and over, with or at risk of non-communicable diseases (NCDs), including diabetes, cardiovascular disease, obesity, and musculoskeletal conditions.
I (Intervention/Exposure)	SP interventions, including nature-based interventions (e.g., outdoor walking groups, green exercise), peer support, and community-based programmes.
C (Comparison)	Usual care, pharmacological treatment, or non-nature-based SP activities (e.g., exercise referral schemes, arts programmes).
O (Outcome)	Biological (e.g., BP, BMI, HbA1c), psychological (e.g., depression, anxiety, wellbeing), social (e.g., connectedness), and behavioural (e.g., adherence, self-care) outcomes.

This framework was used to guide the inclusion criteria, search strategy, and synthesis approach in the umbrella review.

The following search terms were used in various combinations:

(Problem): "non-communicable disease" OR "NCD"

(Intervention): "social prescription" OR "community referral" OR "social referral" OR "community intervention" OR "nature-based intervention"

Outcomes of interest included both objective and subjective health and well-being indicators, including self-reported measures.

Searches were conducted using the databases PubMed, ScienceDirect, and Discovery, along with Google Scholar, selected for their comprehensive coverage of health, behavioural science, and interdisciplinary literature relevant to social prescribing and nature-based interventions. Manual searches of reference lists from included reviews were also performed to ensure comprehensive coverage. The search covered publications from 1 January 2002 to 30 September 2024.

3.2.3 *Screening and Study Selection*

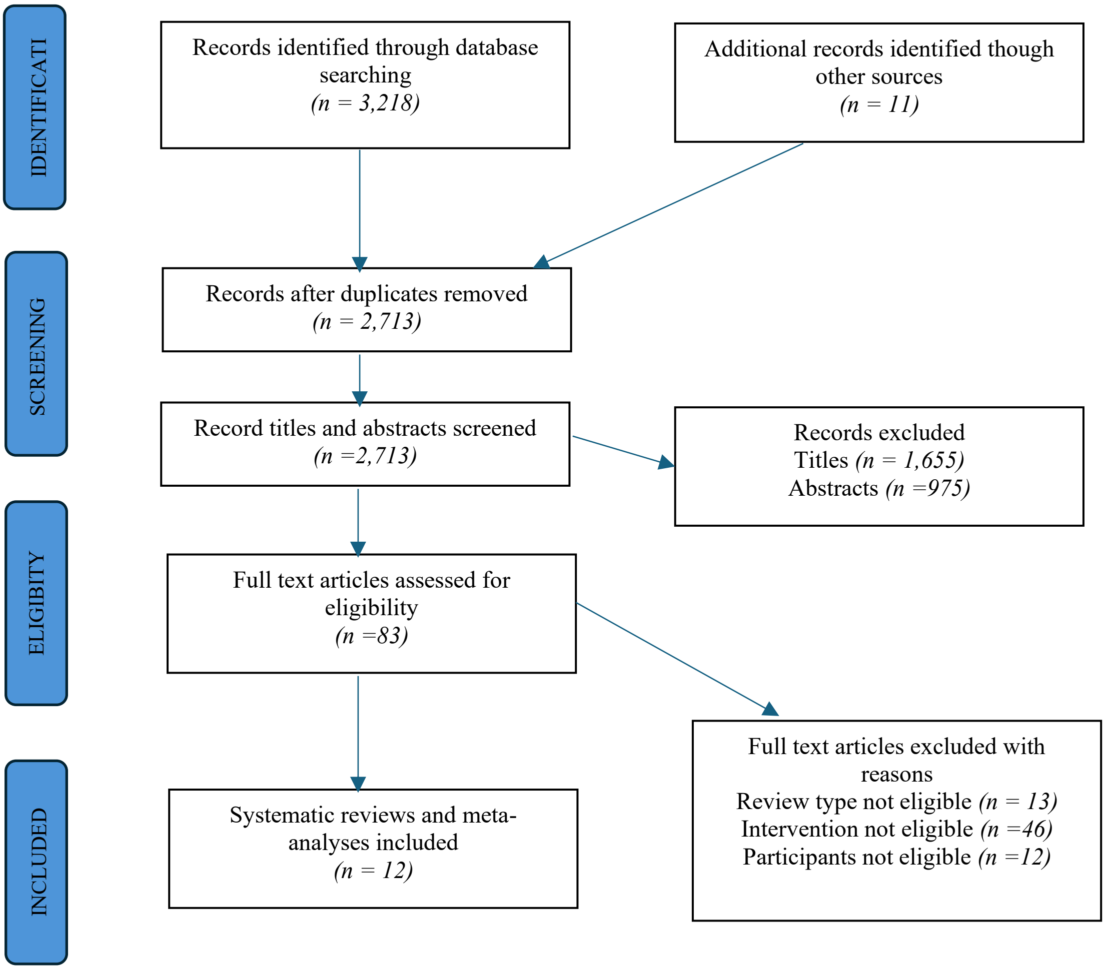
A total of 3,218 records were identified through initial database searches, with an additional 11 records retrieved from hand-searching and reference list screening. After removal of duplicates, 2,731 unique titles and abstracts were screened. Screening was conducted in two phases: first by title and abstract, and then by full-text review. All screening decisions were independently completed by two reviewers (academic supervisors), with disagreements resolved through discussion and consensus.

Eligibility decisions were based on the inclusion and exclusion criteria outlined in Section 3.2.2. A total of 12 systematic reviews met the final inclusion criteria and were retained for data extraction and quality appraisal.

The search strategy covered reviews published between 2002 and 2024. This timeframe was selected to capture developments in SP and nature-based interventions over the past two decades, a period during which these approaches have gained significant traction in research, policy, and practice. A PRISMA flow diagram illustrating the study selection process is provided in Figure 3.1.

Figure 3-1

Prisma Flow diagram of included systematic reviews



3.2.4 *Quality Appraisal*

The methodological quality of the included reviews was assessed using the AMSTAR 2 tool (Shea et al., 2017), which evaluates systematic reviews across 16 domains, including protocol registration, comprehensive search strategies, risk of bias assessment, and consideration of publication bias. Based on this appraisal, four reviews were rated as high quality: Hanson and Jones (2015), Patil et al. (2018), Pavey et al. (2011), and Struthers et al. (2024). These reviews demonstrated strong adherence to AMSTAR 2 criteria, including the use of dual-reviewer processes, risk of bias assessment, and transparent synthesis methods. Five reviews were rated as moderate quality: Nowrin et al. (2023), Chen et al. (2024), Bock et al. (2014), Pescheney et al. (2019), and Arsenijevic and Groot (2017). These reviews generally met core methodological criteria but often lacked protocol registration or comprehensive reporting of funding sources and conflicts of interest. The remaining three reviews, Chatterjee et al. (2017), Bickerdike et al. (2017), and Williams et al. (2007), were rated as low quality. These were largely narrative in nature and lacked systematic methods, failing to meet key AMSTAR domains such as structured search strategies, critical appraisal of included studies, and justification of exclusion criteria.

3.2.5 *Data Extraction*

A structured data extraction tool was developed based on JBI guidelines (Aromataris et al., 2015). Data were extracted on study citation, objectives, review methodology, population characteristics, intervention setting and context, search strategy and databases, date range, inclusion of grey literature, number and type of included studies, geographic origin, intervention types, reported outcomes, funding sources, and main findings relevant to the review questions.

3.2.6 *Data Synthesis*

A narrative synthesis was conducted due to heterogeneity in study design, intervention format, and outcome measurement. Findings were synthesised thematically in relation to the research questions, focusing on the types of SP interventions, comparisons between nature-based and non-nature-based formats, and biopsychosocial and behavioural outcomes. A tabular summary (See appendix Table A1) was developed to present core findings, methodological quality, and outcome domains assessed.

3.3 Results

A total of 12 systematic reviews met the inclusion criteria, collectively synthesising findings from over 250 individual studies focused on SP (SP) interventions for adults with, or at risk of, NCDs. The reviews varied widely in their scope, quality, intervention types, and outcomes reported.

3.3.1 *Types of Socially Prescribed Activities (RQ1)*

The 12 included reviews encompassed a diverse range of SP (SP) interventions, which could broadly be grouped into four overlapping categories: physical activity-based interventions, arts and cultural engagement, volunteering and peer support, and NBSPs. Across these categories, interventions varied in format, intensity, and delivery context, with some explicitly linked to behavioural change techniques and others oriented more toward wellbeing or social connection. Although not all reviews applied consistent taxonomies, the following overview synthesises the most commonly reported types across the dataset (Bickerdike et al., 2017; Nowrin et al., 2023; Pescheney et al., 2019).

Physical activity-based prescriptions were the most frequently documented across the reviews, particularly in relation to individuals at risk of, or managing, cardiovascular and metabolic conditions (Pavey et al., 2011; Patil et al., 2018). These interventions included structured group exercise sessions, gym referral schemes, walking groups, yoga classes, and dance-based movement programmes. Some were delivered in clinical or community settings, while others were facilitated through link workers in partnership with local service providers. Several reviews highlighted the versatility of these programmes, which could be tailored to individual ability and risk profiles, and commonly targeted physical health outcomes such as body mass index (BMI), blood pressure, and aerobic capacity. Notably, reviews also reported psychological and social benefits linked to these interventions, suggesting they operate across multiple domains (Arsenijevic & Groot, 2017; Hanson & Jones, 2015).

Arts and culture-based prescriptions featured prominently in reviews examining wellbeing and mental health outcomes (Bickerdike et al., 2017; Chatterjee et al., 2017). These interventions included visual arts, music and singing groups, creative writing, drama workshops, and storytelling programmes. Unlike more clinically anchored formats, these were often delivered in cultural institutions or community spaces, with an emphasis on creative expression, identity, and belonging. While evidence for their impact on physical health outcomes was limited, multiple reviews identified consistent improvements in mood, self-confidence, and emotional regulation. Importantly, several studies embedded within the reviews also noted secondary social benefits, such as reduced isolation and enhanced peer bonding, particularly for individuals living with long-term conditions or those facing social marginalisation (Chen et al., 2024; Struthers et al., 2024).

Volunteering and peer support interventions represented a third common category, particularly in reviews focused on social isolation and community connectedness (Nowrin et al., 2023; Pescheney et al., 2019). These programmes typically involved structured opportunities to contribute to local organisations, mentor others, or participate in reciprocal peer networks. Rather than delivering clinical or activity-based content, these interventions were rooted in empowerment, purpose, and mutual exchange. Although fewer reviews focused exclusively on this model, those that did highlighted outcomes such as increased social trust, reduced loneliness, and perceived improvements in life satisfaction. Several reviews noted that such models may be particularly effective for older adults, people with mild-to-moderate mental health needs, and those with limited social capital, though high-quality evaluations were often lacking (Bock et al., 2014; Chatterjee et al., 2017).

3.3.2 *Biopsychosocial and Behavioural Outcomes (RQ2)*

Biological outcomes were the most commonly assessed across the included reviews. These included physiological measures such as blood pressure, body mass index (BMI, a ratio of weight to height used to assess overweight and obesity), total cholesterol, average blood sugar levels (HbA1c), and body fat percentage. High-quality reviews including Struthers et al. (2024) and Hanson and Jones (2015) consistently reported statistically significant reductions in blood pressure, BMI, and heart rate following interventions such as outdoor walking groups and nature-based physical activity. These effects were particularly evident in studies targeting older adults, individuals with hypertension, and those who were overweight or obese. Patil et al. (2018) further demonstrated that peer support interventions could result in modest yet meaningful reductions in HbA1c levels among people with type 2 diabetes. Across all reviews, systolic blood pressure was measured in at least seven studies, with average reductions ranging from 5.17 mmHg, while diastolic pressure saw significant reductions between 3.14–3.73 mmHg. BMI was commonly reported in six studies, showing decreases of approximately 0.71–0.92 kg/m^2.

Psychological outcomes were moderately represented but variably reported. Across six reviews, changes in mental wellbeing, mood, anxiety, and depression were examined using validated tools such as the Warwick-Edinburgh Mental Well-being Scale (WEMWBS), the Hospital Anxiety and Depression Scale (HADS), PHQ-9, GAD-7, and GHQ-12. Positive outcomes were more frequently reported in reviews of moderate-to-high quality, particularly those involving NBSPs (Struthers et al., 2024) or structured peer support programmes (Chen et al., 2024; Patil et al., 2018). Reported improvements included reduced fatigue, lower anxiety and depression scores, and enhanced self-efficacy and emotional wellbeing. Effect sizes for psychological benefits ranged from −0.50 to −0.67, particularly in fatigue and depressive symptoms. These outcomes were typically associated with interventions offering consistent peer or facilitator interaction and/or exposure to restorative natural settings. A notable limitation was the lack of long-term follow-up and inconsistent reporting on mental health trajectories.

Social outcomes were the least frequently measured and often lacked conceptual clarity. Only a minority of reviews explored variables such as social connectedness, community participation, or loneliness. Where these outcomes were assessed, most notably in Pescheney et al. (2019) and Chatterjee et al. (2017), often involved community referral schemes or group-based activities such as volunteering or arts participation. Outcome tools included the Work and Social Adjustment Scale (WSAS) and self-reported social functioning scales. However, many studies relied on qualitative descriptions or proxy indicators. Statistically analysed social outcomes were sparse, with inconsistent definitions limiting comparability. Moreover, these outcomes were typically secondary, underpowered, or anecdotal, reducing confidence in claims of social benefit.

Behavioural outcomes included measures of physical activity adherence, programme completion, self-management, and lifestyle modification. These outcomes were addressed in seven of the twelve reviews, particularly those with higher AMSTAR 2 ratings. Arsenijevic & Groot (2017) and Nowrin et al. (2023) identified clear associations between structured intervention formats and higher adherence rates, particularly for programmes exceeding 8 weeks. Reported adherence rates ranged from 50% to 75%, with higher retention observed in interventions involving nature exposure or peer support. Chen et al. (2024) and Patil et al. (2018) both noted improvements in diabetes self-care behaviours, patient activation, and health literacy. Additionally, Williams et al. (2007)

estimated that 17 sedentary adults needed to be referred for one to become moderately physically active, highlighting the modest but measurable behavioural impact of SP interventions. However, longitudinal tracking of behavioural maintenance beyond programme duration remains underexplored in most reviews. It should be noted that findings for other physiological markers, including fasting glucose, serum lipids, and waist circumference, were non-significant or inconsistent across reviews, and the clinical significance of observed changes remains uncertain given the short follow-up periods in most included studies.

A detailed summary of targeted outcomes across included reviews is presented in Table 2 below. This table outlines the direction of change observed, whether interventions were active or social in nature, and the specific studies contributing to each outcome category

Table 3

Summary of outcomes targeted in included reviews.

Outcome	Direction	Active/Social	Studies
Biological			
Blood Pressure	+	Active/Social	Hanson & Jones (2014); Struthers, Guluzade, Zecevic & Walton (2024); *Patil et al. (2018); Nowrin, Mehareen, Bhattacharyya & Saif-Ur-Rahman (2023)*
Resting Heart Rate	+	Active	Hanson & Jones (2014); Struthers, Guluzade, Zecevic & Walton (2024)
Body Fat	+	Active	Hanson & Jones (2014); Struthers, Guluzade, Zecevic & Walton (2024)
BMI	+	Active	Hanson & Jones (2014)

Outcome	Direction	Active/Social	Studies
Total Cholesterol	+	Active/Social	Hanson & Jones (2014) *Nowrin, Mehareen, Bhattacharyya & Saif-Ur-Rahman (2023)*
VO^2	+	Active	Hanson & Jones (2014)
SF-36 Physical Functioning	+	Active	Hanson & Jones (2014)
6-minute walk time	+	Active	Hanson & Jones (2014)
Waist circumference	No sig change	Active	Hanson & Jones (2014)
Fasting glucose	No sig change	Active	Hanson & Jones (2014)
Serum Lipids	No sig change	Active	Hanson & Jones (2014)
Fatigue	+	Active	Struthers, Guluzade, Zecevic & Walton (2024)
HbA1c	+	Social	*Chen, Zhou, Xu, Song, Yin & Gu (2024)*
Psychological			

Outcome	Direction	Active/Social	Studies
Depression	+	Active	Hanson & Jones (2014)
	No sig change	Social	*Chen, Zhou, Xu, Song, Yin & Gu (2024)*
QoL	+	Social	*Chen, Zhou, Xu, Song, Yin & Gu (2024)*
Increase in Physical activity	+	Active	*Pavey et al. (2011); Bock et al. (2014)*
	No sig change		*Williams et al. (2007)*
Adherence rate	+	Active	*Arsenijevic & Groot (2016)*

Note: Active = Interventions involving physical activity. Social = Educational/Peer support interventions. *Non-nature interventions shown in italic.*

3.3.3. *Nature vs Non-Nature Based Interventions: Outcome Comparisons (RQ3)*

A comparative synthesis of nature-based versus non-nature-based interventions identifies some suggestive patterns in outcome profiles, though the limited number of direct comparisons and heterogeneity across included reviews mean these findings should be interpreted with caution:

3.3.3.1. Biological Outcomes. NBSPs reported stronger physiological improvements in several high-quality reviews. For instance, Struthers et al. (2024) found significant reductions in diastolic blood pressure (−3.73 mmHg), heart rate (−7.44 bpm), and body fat percentage (−3.61%). In contrast, gym-based and indoor interventions like those reviewed in Williams et al. (2007) and Pavey et al. (2011) showed less consistent or marginal improvements in comparable markers such as BMI and blood pressure. It should be noted that direct head-to-head comparisons between nature-based and non-nature-based formats were rare across the included reviews, and differences in study populations, duration, and outcome measures limit the conclusions that can be drawn from this comparison.

3.3.3.2. Psychological Outcomes. Nature-based formats demonstrated more favourable psychological outcomes in some reviews. Both Hanson & Jones (2015) and Struthers et al. (2024) reported reductions in fatigue and depression, as well as moderate-to-large improvements in wellbeing indices. Non-nature-based social prescriptions did show improvements, particularly in peer-led formats (Patil et al., 2018), but effect sizes were generally smaller or more variable. However, given the absence of standardised comparison conditions across reviews and the varying quality of included evidence, these differences in effect size should be regarded as preliminary and in need of replication in controlled comparative studies.

3.3.3.3. Social Outcomes. While data were limited, NBSPs often featured group activities in outdoor settings, fostering incidental social interaction. However, these were not consistently evaluated. Broader SP schemes (e.g., Chatterjee et al., 2017) reported social benefits but lacked robust outcome measurement.

3.3.3.4. Behavioural Outcomes. Higher adherence and retention were noted in NBSPs, often exceeding 70%, particularly in walking programmes or green exercise schemes (Hanson & Jones, 2015). Non-nature-based social prescriptions, such as structured indoor exercise referral programmes, demonstrated lower adherence and greater drop-out rates, with drop-out attributed to a range of factors including accessibility, programme structure, and individual motivation. However, adherence figures were not consistently defined or reported across reviews, and comparisons between NBI and non-NBI programmes were not made on equivalent populations or programme formats, limiting the reliability of these contrasts.

In summary, NBSPs appear to yield some evidence of stronger biopsychosocial benefits compared to certain non-nature-based formats, particularly in relation to physiological and psychological outcomes. These patterns are consistent with theoretical accounts of the synergistic effects of combining physical activity with natural environments (Kaplan & Kaplan, 1989; Ulrich, 1983). However, given the limited number of direct comparisons in the reviewed literature, the heterogeneity of included populations and designs, and the variable quality of evidence, these findings should be treated as indicative. Further comparative research using standardised designs is needed before definitive conclusions can be drawn about the relative effectiveness of NBSPs.

Taken together, the evidence base supports the biopsychosocial potential of SP interventions, particularly when interventions are grounded in behaviour change theory, delivered in accessible and meaningful contexts, and evaluated using rigorous, standardised tools. There is a wide range of outcome domains reported across reviews, yet disparities in measurement tools, statistical reporting, and follow-up periods persist. Future research should prioritise comprehensive outcome measurement frameworks that better capture the interplay between biological, psychological, social, and behavioural domains, and account for both short- and long-term effects across diverse populations and delivery formats**.**

3.4 Discussion

This umbrella review synthesised evidence from 12 systematic reviews on the health-related outcomes of SP (SP) interventions, with a particular focus on biological, psychological, and social domains relevant to health behaviour change. The findings support the growing body of literature suggesting that SP interventions can have positive effects across multiple outcome areas, particularly among adults with, or at risk of, NCDs (Bickerdike et al., 2017; Chatterjee et al., 2017; Husk et al., 2019). These findings directly address Research Question 1, which explored the influence of SP on biopsychosocial factors known to shape health behaviour.

Biological outcomes, such as blood pressure, body mass index (BMI), and blood sugar levels (HbA1c), were the most frequently reported. This is perhaps unsurprising, given that systematic reviews, particularly those focused on NCDs, tend to prioritise clinically measurable endpoints (Craig et al., 2008). Several high-quality reviews, such as Hanson and Jones (2015) and Struthers et al. (2024), reported statistically significant improvements in these measures following interventions such as outdoor walking groups and nature-based physical activity. These findings are consistent with existing meta-analyses on group exercise and green space exposure (Pavey et al., 2011; Shanahan et al., 2016) and confirm that SP interventions can influence physiological markers relevant to NCD management.

Psychological outcomes were also frequently reported as improved across several reviews, though findings were variable in quality and scope. These included reductions in anxiety, depression, and psychological distress, along with improvements in wellbeing, confidence, and self-esteem (Chatterjee et al., 2017; Chen et al., 2024). These findings align with evidence on the benefits of participatory arts, social engagement, and exposure to nature (Bragg & Atkins, 2016; Fancourt & Finn, 2019). Importantly, they reinforce the argument, central to Research Question 1, that SP interventions influence emotional and cognitive states that underpin behaviour, particularly in relation to motivation, coping, and self-regulation (Kelly & Barker, 2016). However, it is important to note that several reviews relied on heterogeneous outcome tools, short follow-up periods, and narrative rather than statistical synthesis, which limits the certainty of these conclusions. Where low-quality reviews (Chatterjee et al., 2017; Williams et al., 2007) are included, claims of consistent improvement should be interpreted with appropriate caution.

Social outcomes, though less consistently measured, were reported in eight of the twelve included reviews, though typically as secondary outcomes without validated tools or statistical analysis. Where reported, findings included some evidence of improved perceived social support, reductions in loneliness, and increased participation in community life (Nowrin et al., 2023; Pescheney et al., 2019). Positive patterns appeared more frequently in group-based formats, including volunteering and peer support models and support qualitative findings showing that social connectedness is a key mechanism through which SP enhances wellbeing (Fixsen et al., 2020; Wildman et al., 2019). As such, these findings also contribute to RQ1, offering evidence that SP influences social determinants that, in turn, facilitate healthier behaviours. Given the limited use of standardised social outcome measures across included reviews, however, the strength of this evidence should be considered indicative rather than conclusive.

In exploring Research Question 2, which examined similarities and differences between traditional SP and NBSPs, the review found some suggestive but inconclusive patterns. While NBSPs were less frequently evaluated, they appeared to offer distinctive cross-domain benefits, combining physical activity, social interaction, and restorative engagement with nature. These findings are supported by previous work showing that NBSPs can enhance stress regulation, cognitive function, and affective states in ways that may differ from other SP formats (Shanahan et al., 2016; van den Bosch & Ode Sang, 2017). However, few reviews directly compared NBSPs to traditional models, and heterogeneity in intervention design limited conclusions about relative effectiveness. Further comparative research is needed to establish whether NBSPs deliver unique or additive effects in specific populations.

Taken together, these findings suggest that SP interventions, particularly those that are participatory, group-based, and tailored to user needs, can influence a wide range of health-related outcomes across the biopsychosocial spectrum. The review offers preliminary evidence in support of SP as a platform for behaviour change and identifies domains where NBSPs may offer additional value. These insights will directly inform the development of a contextually grounded intervention, as well as the qualitative inquiry in Chapter 4.

3.5 Implications for Policy and Practice

The findings of this umbrella review highlight several important implications for the development and implementation of SP (SP) interventions in real-world settings.

First, there is a need for greater theoretical and strategic coherence in how SP is embedded into routine healthcare. Policymakers should support enhanced training for GPs and link workers, alongside more consistent referral pathways, to reduce variability in implementation. At present, inconsistent delivery risks undermining the potential benefits of SP at scale.

Second, the role of NBSP should be further recognised and supported. The evidence reviewed suggests that NBSPs have the potential to deliver benefits across biopsychosocial domains, and that adherence and acceptability appear relatively favourable compared to some indoor formats. However, the evidence base remains heterogeneous and largely observational, and these patterns should inform rather than definitively guide policy decisions pending more robust comparative evidence. This strengthens the case for investment in green infrastructure, particularly in underserved urban areas, and the formal inclusion of NBSP in SP commissioning frameworks.

Third, service providers should be encouraged to diversify the range of SP offers, moving beyond physical activity towards more personalised, meaningful interventions. For marginalised groups, interventions should include embedded social support mechanisms that address barriers to engagement.

Finally, practice-based outcome measurement should be improved and standardised. This includes tools that assess not only clinical change, but also social connectedness, self-efficacy, health literacy, and behavioural maintenance, reflecting the full scope of SP’s impact.

3.6 Implications for Research

This review identifies several priorities for strengthening the evidence base on SP and NBSPs. First, there is an urgent need for longitudinal studies to evaluate the sustainability of behaviour change and wellbeing improvements over time. Many existing studies focus on immediate post-intervention effects, leaving long-term impact and adherence unclear.

Second, researchers should adopt standardised outcome measures that reflect the biopsychosocial model. These should be sensitive to change over time and applicable across diverse populations and SP formats, capturing not just health outcomes but also social functioning and engagement behaviours.

Third, further research should investigate the mechanisms of change. Currently, few studies explain how or why SP works or explore the specific components that drive outcomes across different formats (e.g., arts-based vs. nature-based). The application of established behavioural models, such as SCT or the HBM, could support this work by clarifying causal pathways.

Fourth, comparative effectiveness research is needed to assess which SP modalities are most impactful, cost-effective, or acceptable in different population subgroups. This includes mixed-methods studies and head-to-head trials comparing peer-led, community-based, and nature-based approaches.

Crucially, this review also highlights a significant gap in understanding the lived experiences, perceptions, and contexts that shape engagement with SP and NBIs. While many programmes report positive outcomes, social and psychological impacts are often anecdotal, and variability in engagement remains a key limitation. This gap makes it difficult to determine not only what works, but for whom, why, and under what conditions.

Addressing this issue is integral to Step 1 of the IM process, which begins with a comprehensive needs assessment. The umbrella review presented here constitutes one part of that assessment, establishing broad patterns in the literature and identifying outcome domains most relevant to SP and NBSPs. However, by its nature, a review of reviews cannot capture the nuanced, experiential, and structural factors that affect real-world uptake and sustainability. To complement these findings, the next phase of this thesis involves a qualitative study exploring stakeholder experiences and barriers to engagement. Together, these strands form a multi-layered needs assessment that underpins the subsequent stages of IM. These later stages, including the development of matrices of change objectives and intervention design, are described in depth in Chapter 5.

3.7 Limitations

Several methodological limitations of this review warrant explicit acknowledgement. First, the twelve included reviews varied substantially in methodological quality, with three rated as low quality on the AMSTAR 2 tool and five rated as moderate. Conclusions drawn in this chapter reflect the overall pattern of evidence but are strongest when supported by the four high-quality reviews (Hanson & Jones, 2015; Patil et al., 2018; Pavey et al., 2011; Struthers et al., 2024). Where claims rely on low- or moderate-quality reviews, they should be considered tentative rather than definitive.

Second, the heterogeneity of included studies presents a significant challenge to synthesis. Interventions varied in format, duration, setting, and theoretical grounding, while outcome measures differed across reviews, particularly for psychological and social domains. Narrative synthesis was employed precisely because this heterogeneity precluded statistical pooling, but this means that observed patterns across outcome domains reflect broad directional trends rather than precise effect estimates. Readers should be cautious about interpreting these patterns as demonstrating the uniform effectiveness of SP or NBSPs.

Third, and most importantly for Research Question 2, direct comparisons between nature-based and non-nature-based SP formats were rare across the included literature. The comparative patterns reported in Section 3.3.3 are drawn largely from studies that evaluated one format independently, with cross-study contrasts made at the review level. As such, differences in observed outcomes between NBI and non-NBI formats may reflect differences in study populations, delivery conditions, or measurement approaches rather than inherent differences in intervention efficacy. These comparisons are therefore exploratory and hypothesis-generating rather than confirmatory and should be treated as a platform for future comparative research rather than as conclusive evidence of NBI superiority.

Finally, social outcomes were the least systematically measured domain across the included reviews. Most were reported as secondary outcomes using proxy indicators or qualitative descriptions rather than validated tools, and few were subjected to statistical analysis. This substantially limits the conclusions that can be drawn about the social mechanisms of SP and NBSPs and suggests that this domain requires dedicated measurement frameworks in future research.

Chapter 4 A Qualitative Needs Assessment to Explore Barriers and Opportunities to Engagement with SP and Socially Prescribed Activities.

4.1 Chapter Overview

SP and NBSPs are increasingly recognised as promising approaches for improving health and wellbeing, particularly in relation to NCDs. While evidence suggests that these interventions can positively influence biopsychosocial and behavioural determinants of health, including stress, physical activity, and social connectedness, their implementation remains inconsistent and often shaped by local availability rather than need or evidence (Cooper et al., 2024; Fixsen et al., 2020).

The umbrella review presented in Chapter 3 (Study 1) identified key limitations in the current evidence base, including inconsistent outcome measures, variation in intervention delivery, and challenges in replicability. These findings emphasised the importance of grounding intervention development in a systematic framework. Accordingly, the IM framework was adopted as a systematic, theory- and evidence-informed approach to developing a tailored intervention. Step 1 of this process, a needs assessment, was achieved through both a review of existing literature (umbrella review) and the qualitative study presented in this chapter.

This qualitative study (Study 2) represents the second part of Step 1 in the IM process. Whereas the umbrella review in Chapter 3 addressed Research Questions 1 and 2 by consolidating existing evidence on the outcomes of SP and NBSPs, this study turns to the perspectives of those most directly involved in delivery and use. It aimed to explore the perceptions of two key stakeholder groups: (1) individuals involved in delivering socially prescribed activities and (2) members of the public who might access or be referred to these activities. By examining their experiences, perceived barriers and opportunities to engagement, and views on the types and delivery of activities typically prescribed, particularly those that are nature-based, this study addresses the third overarching research question of the thesis:

- RQ3: Do different stakeholder groups perceive different opportunities and barriers to using social prescriptions, specifically NBIs?

To answer this question, the study used interviews and focus groups to explore barriers and opportunities for engagement with SP. It also examined how stakeholder perceptions varied across roles (e.g., service users, implementers, and adopters), as well as by age, gender, and self-reported health status. These variables were selected based on evidence presented in Chapter 1, which highlighted the influence of demographic and psychosocial factors on both the risk of NCDs and engagement with preventative health interventions.

For instance, women, particularly those with caregiving responsibilities, may face time-related barriers and experience guilt when prioritising their own wellbeing (Kelly & Barker, 2016). Older adults or individuals with mobility limitations may encounter environmental and physical access barriers to participating in nature-based interventions (Jennings et al., 2016; Shanahan et al., 2015). Likewise, perceived health status can shape motivation: under the HBM, individuals are less likely to engage in preventive health behaviours if they do not perceive themselves as susceptible to a condition or do not see the benefits of action outweighing the barriers (Rosenstock, 1974).

Additionally, SCT emphasises the role of self-efficacy and observational learning in enabling behaviour change (Bandura, 1986). For groups with lower confidence or fewer positive role models, these psychological and social influences may reduce engagement, even when opportunities are available. By exploring these differences, the study aimed to identify how structural and psychological determinants intersect with demographic variables, insights that are critical for designing inclusive, targeted interventions.

4.2 Method

The qualitative methods in this study aimed to collect data relating to the barriers and opportunities to engagement with SP and socially prescribed activities, with a focus on NBSPs. To achieve this, the study employed both semi-structured interviews and focus groups. Interviews were conducted with members of the public who had accessed, or might access, SP to allow for more personal, in-depth exploration of individual experiences, attitudes, and perceived barriers in a setting that offered privacy and emotional safety. This format was particularly appropriate given that discussions often involved reflections on health, confidence, and wellbeing that participants might have been less comfortable sharing in a group environment.

In contrast, focus groups were conducted with implementers and adopters to encourage discussion, comparison, and reflection on shared challenges in service delivery, and to surface potential areas of consensus or divergence in practice. Group-based dialogue was particularly suited to these participants, whose roles are inherently collaborative and embedded within organisational systems, allowing for the co-construction of insights about delivery processes and inter-professional dynamics (Kitzinger, 1995; Morgan, 2019). The combined use of both methods was intended to maximise the richness and breadth of the data: interviews offered privacy and depth for more sensitive or personal insights, while focus groups facilitated interaction and collective meaning-making among professionals working within SP pathways. This division also reflected real-world practice, where individuals (patients) typically make SP decisions in one-to-one consultations with GPs or link workers, whereas implementers and practitioners operate collaboratively within multi-professional systems. Designing the study in this way therefore mirrored the natural dynamics of SP delivery, enhancing ecological validity and relevance to practice.

4.2.1 ***Participants and recruitment***

This study involved two key stakeholder groups: (1) members of the public who were eligible for, interested in, or might in future access SP or socially prescribed activities (referred to hereafter as potential service users), and (2) implementers and adopters involved in the referral, planning, or delivery of such interventions.

A total of 20 participants took part in the study. Of these, 11 were potential service users, all of whom participated in individual semi-structured interviews. Eligibility criteria for this group required participants to be aged 18 or over, fluent in English, and living in England. Participants were not required to have prior experience of SP; the study sought to capture perspectives from individuals who represented the population most likely to be referred to such interventions. Participants were recruited via social media adverts (Appendix A), and snowball sampling was employed to broaden reach and identify individuals beyond the researcher's immediate contacts.

The remaining nine participants were stakeholders: four implementers (social prescribers working in NHS primary care) and five adopters (individuals involved in delivering socially prescribed activities in the community or voluntary sector). These participants were invited to take part in focus groups to facilitate interactive discussion and reflection on their shared roles in SP. Recruitment for this group was supported through a targeted email (Appendix B) circulated via the Social Prescribing Network and existing community and healthcare contacts who could share the invitation with relevant colleagues. However, due to availability constraints, two stakeholder participants were interviewed individually, resulting in three mini focus groups (each comprising two to three participants) and two one-to-one interviews.

Sampling was purposive and aimed at capturing diverse perspectives within and across the two groups. Sample size was informed by qualitative research guidance, which emphasises depth over breadth and supports relatively small samples where the focus is on rich, contextualised understanding (Braun & Clarke, 2021).

Prior to finalising the recruitment strategy, a Health Psychologist with expertise in behaviour change and health inequalities was consulted. This consultation aimed to strengthen the study's approach to inclusive recruitment and ensure alignment with best practice in engaging underrepresented groups. The Health Psychologist advised that efforts to include participants from ethnically minoritised backgrounds would be more effective if conducted through existing community relationships, rather than one-off invitations. In response, the research team contacted two charities and one community group working with ethnic minority populations, and shared study information through their trusted networks. This strategy was intended to build trust by linking the research with organisations already known and respected within the community. Although the overall response remained limited, these efforts acknowledged that inclusive recruitment often relies on sustained, relationship-based engagement, particularly among groups historically underrepresented in research.

All participants were given the option to take part in interviews or focus groups either in person at a convenient location or online via Microsoft Teams. These options were determined based on accessibility, participant preference, and ethical considerations. This flexible approach supported inclusion and allowed participants to choose settings that felt safe and comfortable for them.

To provide context for the qualitative data that follow, Tables 3 and 4 present a summary of participant characteristics across the study's stakeholder groups. Table 3 outlines the demographic and self-reported health information for potential service users who participated in individual interviews. Table 4 summarises the characteristics of implementers and adopters who took part in focus groups or interviews. Health ratings and perceived risk of NCDs were self-reported by participants and reflect their personal understanding rather than clinical diagnosis. Participants were asked to indicate their age range (e.g., 35–44, 55–64) rather than provide their exact age. This approach was adopted to maintain participant confidentiality, particularly within small professional networks, and to reduce the sensitivity associated with personal demographic disclosure. It also ensured that demographic information was collected in a format appropriate to the qualitative focus of the study, where age served primarily as contextual rather than comparative data.

Table 4

Participant Characteristics – Potential Service Users

Participant ID	Gender	Ethnicity	Age Range	Health Rating	NCD Risk Status
U01	Female	White	45–54	Good	Maybe
U02	Female	White	35–44	Good	Yes
U03	Female	White	55–64	Fair	Yes
U04	Female	White	25–34	Good	Yes
U05	Male	White	35–44	Fair	Maybe
U06	Male	White	35–44	Good	Maybe
U07	Male	White	55–64	Good	No
U08	Female	White	65–74	Fair	Yes
U09	Female	White	18–24	Good	No
U10	Female	White	35–44	Good	No
U11	Female	White	35-44	Good	Maybe

Note. NCD = non-communicable disease. Health ratings and risk status are based on participants' self-perception and self-reported health experiences.

Table 5

Participant Characteristics – Implementers and Adopters

Group	Sample Size (n)	Setting	Ethnicity (n)	Gender (n)
Implementers	4	NHS Primary Care	4 White British	1 Male, 3 Female
Adopters	5	Voluntary and Community Sector	5 White British	5 Female

Note. Group roles are based on participants' professional responsibilities in SP/NBI implementation or delivery. Ethnicity and gender were self-reported

4.2.2 *Materials*

Two separate topic guides (Appendix C) were developed for this study: one for use in interviews with potential service users, and another for use in focus groups with implementers and adopters. Although both were designed to explore perceptions and experiences of SP and nature-based interventions, they were tailored to reflect the different roles, contexts, and knowledge of each participant group. It was not appropriate to ask users the same questions as those facilitating or delivering SP, so the content and tone of each guide were adjusted accordingly. The topic guide was informed by existing literature on qualitative health research and topic guide development (Kallio et al., 2016) and was closely aligned with the study's research objectives.

The guide was initially tested in a pilot interview with a volunteer participant who met the inclusion criteria. The volunteer took part in a full mock interview and provided feedback on the clarity, wording, and relevance of the questions. Feedback was used to assess the guide's flow and comprehensibility. Although focus groups were not piloted separately, changes made based on the interview pilot were reflected in both versions of the topic guide.

As a result of the pilot, several refinements were made. Some questions were reworded for clarity, and additional probing prompts were added to encourage deeper responses and richer discussion. For example, a question originally asking, "What experience have you had with nature/green prescriptions?" was expanded to include prompts such as "What was it like?", "How did it benefit you?" And "How could it have been improved?"

While there was thematic overlap between the interview and focus group guides, adjustments were made to account for the group setting. For instance, focus group guides included more open-ended prompts designed to spark discussion and allow participants to respond to each other's views, such as "What challenges do you all face when delivering these kinds of activities?"

While there was some thematic overlap, separate topic guides were developed for interviews and focus groups to reflect the different roles and experiences of the participant groups. The interview guide for potential service users focused on personal experiences of being referred to or participating in activities, perceptions of barriers and opportunities, and emotional or behavioural impacts. In contrast, the focus group guide for implementers and adopters explored issues such as referral pathways, service capacity, perceptions of user engagement, and practical challenges related to delivery. Both guides were designed to align with the study's objectives but tailored to the knowledge, responsibilities, and lived experiences of each group.

Topic guides were used flexibly during both interviews and focus groups. Participants were encouraged to contribute any additional insights they felt were relevant, and the researcher probed further where appropriate. A digital recorder was used for in-person interviews, while Microsoft Teams was the primary platform for online data collection. Although two interviews were initially conducted via Zoom, the University of Sunderland later advised switching to Microsoft Teams due to updated data protection guidance.

4.2.3 *Procedure*

Individuals were given an information sheet to ensure they were aware of the study they would be taking part in (see Appendix D). Following this, they were given a consent form (see Appendix E) to sign and date to confirm they were happy to take part and that they could withdraw from the study at any time, including removing their data after the study was complete. The information sheet and consent form had been pre-approved by the University of Sunderland Research Ethics Group (see Ethics section). Participants were interviewed by Tina Robson, PhD student and main researcher, who attended training in conducting and analysing qualitative interviews and data provided by the University of Sunderland.

All interview participants were asked to provide demographic data (age, gender, locality, and ethnicity) and to answer questions related to their health perception (Appendix F). Interviews and focus groups were carried out between February 2023 and February 2024 and ranged between 30 and 75 minutes. Face-to-face interviews were conducted in a private room, and online participants were asked to ensure they had a quiet space and a stable internet connection. Participants were informed that the interview could take up to one hour and would be recorded. Although interviews and focus groups conducted online were video recorded by default using Microsoft Teams, only the audio recordings were used for transcription and analysis. No visual data were retained. Participants were given the opportunity to ask any questions prior to beginning. Following this, interviews were transcribed verbatim by Tina Robson. All information was handled in accordance with ethical and data protection guidelines.

4.2.4 *Ethics*

Ethical approval was obtained from the university ethics board (see Appendix G) and the BPS Code of Human Research Ethics (2021) was fully considered and adhered to. Participants were briefed and informed of content before they agreed to take part and were also provided with details of the academic supervisor on the information sheet, should they have felt they needed to seek any further support upon completion of the study. Consent was taken from individuals based on the information sheet they had been provided, as well as the opportunity they had to ask questions before the study commenced.

Another ethical consideration was the storage and management of data. The data were anonymised on transcription so that individuals could not be identified from the information they had given. Participants were informed that their interviews were recorded. Data were kept in locked cabinets or on a password protected computer and will not be kept for longer than necessary in line with university ethics.

4.3 Data analysis

The qualitative data collected through interviews and focus groups were analysed using Reflexive Thematic Analysis (rTA), as outlined by Braun and Clarke (2006, 2021). This method was chosen for its flexibility, theoretical transparency, and appropriateness for applied health research and intervention development. rTA is particularly well suited to studies situated within a critical realist paradigm, as it enables the identification of both semantic and latent meaning within the data while acknowledging the researcher's role in interpretation (Fletcher, 2017).

rTA also allowed for rich, detailed exploration of stakeholder perspectives while maintaining sensitivity to the different contexts in which participants were situated. Its iterative and recursive nature was especially important for developing themes that were both grounded in lived experience and capable of informing the design of practical interventions (Clarke & Braun, 2018). The method's flexibility supported comparisons across service users, implementers, and adopters, aligning closely with the third research question, which asked whether different stakeholder groups perceive distinct opportunities and barriers to NBSPs.

The analysis was conducted primarily inductively. Codes and themes were developed directly from the data rather than from a predefined framework. However, the process was theory-aware, with relevant constructs from SCT (Bandura, 1986), the HBM

(Rosenstock, 1966), and environmental psychology (e.g., SRT and ART) used to sensitise the interpretation process.

The process followed Braun and Clarke's six phases of rTA: (1) familiarisation with the data, (2) generating initial codes, (3) constructing themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. All transcripts were transcribed verbatim and read multiple times by the lead researcher, who maintained a reflective journal to support reflexivity throughout the process. Coding was conducted manually, allowing for close engagement with both semantic content and underlying meanings. The progression from initial coding to the development of final themes for Study 2 is shown in Table A2 (See Appendix), while illustrative participant quotes supporting each theme are presented in Table A3 (See Appendix A). Themes were iteratively refined and compared across stakeholder groups to ensure they reflected meaningful variation and depth.

This approach enabled the analysis to remain grounded in participant experience while producing insights that could be operationalised in the development of NBIs. The use of rTA ultimately supported a coherent, theory-informed, and practice-oriented understanding of the barriers and opportunities of engagement with socially prescribed activities.

4.3.1 *Reflexivity*

As the researcher, I maintained an embedded and active role throughout this study, being responsible for recruitment, data collection, and analysis. My professional background in the NHS and experience facilitating socially prescribed activities positioned me as an insider, offering a nuanced understanding of both clinical systems and community-based wellbeing initiatives. This dual perspective enabled rapport building with participants, particularly those from primary care and the voluntary sector, and provided deeper insight into the relational and structural tensions often encountered in the delivery of SP.

My familiarity with NHS language, referral pathways, and organisational pressures contributed to more contextually grounded interviews with implementers, while my experience in community-based delivery shaped the topic guides and helped me interpret themes related to engagement, motivation, and access. Within rTA (Braun and Clarke, 2021) framework, these subjectivities are not viewed as sources of bias but as integral to meaning making. Rather than seeking objectivity, reflexive analysis acknowledges that researcher perspectives inevitably shape data interpretation, and that transparency and reflexivity are essential to rigour.

To support reflexivity, I maintained a detailed reflective journal throughout the research process. This included documentation of assumptions, interpretive decisions, emotional reactions, and moments of surprise or discomfort. These reflections helped me critically question how my background may have influenced what I noticed or prioritised in the data and prompted repeated returns to the transcripts to remain open to participants' voices.

I also shared early thematic ideas with colleagues outside the immediate research context, not to achieve coding agreement or establish inter-rater reliability, which is not a goal within reflexive analysis, but to invite alternative perspectives and challenge my assumptions. These discussions supported analytical reflexivity by helping me distinguish between participant meaning and my own professional framing.

I remained particularly aware of power dynamics during focus groups with professionals, where my practitioner identity may have introduced implicit expectations or social desirability pressures. In some cases, familiarity appeared to enhance trust, while in others, it may have led participants to be more cautious. I attempted to minimise these dynamics through neutral questioning, open body language, and repeated reassurance that all perspectives, including criticism, were welcomed and valuable.

In sum, my insider status was not a source of bias in the traditional sense but a position of influence that shaped both access to the field and interpretive insight. Through sustained reflexive practice, I aimed to strike a balance between empathy and critical distance, enhancing the credibility and contextual sensitivity of the analysis.

4.4 Results

During the interviews and focus groups, participants were asked to share their views on SP and socially prescribed activities, as well as any barriers or motivations that influenced their engagement. The analysis explored not only general attitudes but also the specific personal, social, and systemic factors that shaped participation.

The sample included 11 service users (8 female, 3 male), mostly aged between 25 and 64. These individuals reported varying levels of self-rated health, ranging from “Good” to “Fair.” While four participants perceived themselves to be at risk of NCDs, others expressed uncertainty or believed they were not at risk. Their experiences and perspectives reflected a broad cross-section of potential service users, including those with different levels of self-reported confidence about engaging with health services, familiarity with SP, and self-rated health status.

It was established early in the interviews that none of the service users had previously accessed a formal social prescription, nor had they been referred to a nature-based intervention through a prescribing pathway. As such, their reflections were grounded in general awareness of SP and in informal, self-directed experiences of being in nature. When asked about the potential value of NBSPs, participants drew on these personal experiences, imagining how structured activities in natural environments might support their own wellbeing or that of others. This context is essential for interpreting participants' expectations, perceived benefits, and uncertainties about these interventions.

In addition, nine stakeholders took part in the study, comprising four implementers (also referred to as social prescribers or link workers) and five adopters (community-based professionals who plan or deliver socially prescribed activities). Implementers were recruited from NHS primary care settings (1 male, 3 female), while adopters, all female, were affiliated with voluntary and community sector organisations.

This diversity of roles and perspectives enabled the development of a detailed and multi-layered thematic analysis. Six overarching themes were identified through the analysis, each of which encompasses several sub-themes. These reflect the key issues that influenced engagement with SP, whether from the perspective of service users, those referring individuals into activities, or those delivering them on the ground.

The six themes developed through this process were: resources and practical barriers, staffing and training, developing trust, the value of the experience, expectations and capacity, and perceived outcomes and change. These categories represent the core influences on engagement and illustrate how structural, emotional, and interpersonal factors interact in shaping participants' willingness and ability to engage. Sub-themes within each category explore specific motivations and barriers, such as time constraints, transport, trust in facilitators, enjoyment of nature, and perceptions of effectiveness.

Importantly, certain topics emerged more strongly among particular groups. Service users tended to focus on tangible barriers such as time, transport, and confidence, as well as their experiences of enjoyment, purpose, and connection. Adopters and implementers, by contrast, more often discussed the challenges of service delivery, including staffing limitations, mismatched expectations, and the pressures of working within under-resourced systems.

The results are therefore organised to reflect both commonalities and contrasts across these groups. Each of the six themes is presented with supporting sub-themes and illustrative quotations, ensuring that the complexity of participants' views is captured in their own words. Where relevant, distinctions between stakeholder perspectives are made explicit to show how different roles shape experiences of, and responses to, SP.

This layered structure offers both a comprehensive overview of the data and a closer look at the more nuanced influences on engagement. In doing so, it supports a deeper understanding of how SP operates not just as a model of care, but as a lived experience shaped by personal beliefs, organisational practices, and wider social contexts.

The findings from the interviews and focus groups are presented below as a series of main themes, each of which reflects a key area influencing engagement with SP and socially prescribed activities. Within each main theme, sub-themes explore specific patterns or perspectives that emerged from the data.

Importantly, differences in participant experience were shaped by factors such as age, gender, health status, and stakeholder role (i.e., service user, adopter, or implementer). These dimensions were critical to addressing the third research question, which asked whether different stakeholder groups perceive different opportunities and barriers to using social prescriptions, particularly nature-based interventions. Highlighting these differences allows for a more nuanced understanding of how SP is experienced, and where tailored approaches may be needed to support more equitable and inclusive engagement.

4.4.1 ***Resources***

The theme of resources refers to the practical, environmental, and logistical factors that influenced whether participants felt able to engage with socially prescribed or community-based wellbeing activities. While this theme was most prominent in the interviews with service users, elements of it also appeared in the reflections of adopters, who described the challenges of designing and delivering activities that were accessible to a broad and diverse population.

Service users consistently highlighted limited time, difficult terrain, weather conditions, and transport barriers as significant obstacles to engagement. These resource-related issues were often experienced not in isolation, but as overlapping challenges that made participation feel emotionally or logistically unmanageable.

Adopters echoed these concerns, offering further insight into how environmental and economic conditions limited participation for certain groups, particularly older adults, individuals with mobility issues, or those experiencing financial hardship. While implementers (social prescribers) spoke less about these barriers directly, they were often implicated in broader discussions about referral pathways and capacity.

Each subtheme below unpacks one of these key resource-related barriers, drawing attention to the ways in which they were experienced differently across participant groups.

4.4.1.1 Time constraints and competing demands. Time emerged as one of the most commonly reported barriers to engagement with socially prescribed and community-based wellbeing interventions. This was particularly evident in the accounts of service users, especially those juggling employment, caregiving responsibilities, or both. Many described an interest in taking part but felt unable to prioritise participation due to the volume and intensity of daily commitments. Time was not only scarce but often experienced as something that had to be actively defended or justified, particularly when the proposed activity was not seen as essential.

For some, even scheduling routine healthcare was difficult. One participant described how work pressures made it challenging to seek support, even when her health was clearly affected:

> Time, finding time. Even finding time to go to the GP. My boss at work said, cause I've discussed you know my feeling lightheaded and things with her and she really, really forced me to go to the GP and I had been putting it off because I just don't have time. (Service user, U04)

Others explained that their time was consumed by household and family responsibilities. The mental and emotional energy required to consider taking time out for themselves often led to disengagement, even if the activity sounded appealing, one participant said, "The time goes so quickly" between clubs, football, and household responsibilities. (Service user, U01)

> I don't think oh that's just a little hour out of my day, like, let's go. I'm like, oh it's a whole hour out of my day and I sometimes forget how much I can cram in… And, timing, I like to do thing first thing in the morning. (Service user, U01)

In these accounts, time was framed not only as a logistical issue, but as an emotional and psychological one. Participants described weighing the potential benefit of an activity against the disruption it might cause to established routines. Activities that were local, familiar, or easily integrated into existing schedules were more likely to be considered:

> When and where are they, how accessible the activity is, can I do it from home? Do I have to travel somewhere? If it's something local I'm more likely to do it than if I've got to travel further. How often and what's the return? (Service user, U01)

Concerns about timing were particularly acute for those working full-time. Participants noted that many activities were scheduled during weekday hours, excluding those who worked standard shifts, one stated,

> I guess the only thing at the moment that would stop me would just be if it was through the day, through the week. Um, just because of work, you know, and timings, that would be the only thing. Because there is, a lot of things do seem to happen through the day, um, and I think anyone that works sort of half eight till 5 like I do, um, we're really at a disadvantage. (Service user, U02)

Although adopters did not raise time as a personal barrier, several acknowledged its impact on participant attendance. They observed that working-age adults and those with families were less likely to attend unless activities were scheduled flexibly, such as during evenings or weekends. However, delivering flexible provision was often difficult within limited staffing and funding structures.

Social prescribers also reported that time constraints were one of the most frequently mentioned barriers during referral conversations. While they attempted to offer a variety of options that could fit into individuals' routines, they often had limited influence over the scheduling and design of available services. One noted that even when participants were interested, "timing is always one of the sticking points."

The implications of time constraints are particularly relevant for NBIs. NBIs often require travel to specific outdoor locations and may be more rigidly tied to daylight hours or weather conditions. For participants already navigating full schedules, these added layers of planning and uncertainty can reduce feasibility. This reinforces the importance of embedding flexibility and low-effort access into the design of NBIs, especially for those who cannot easily carve out large or predictable blocks of time.

Taken together, these findings suggest that time is not merely a logistical resource, it is shaped by emotion, identity, and social role. For many participants, allocating time to their own wellbeing felt indulgent or unrealistic, particularly when other responsibilities took precedence. Addressing this barrier may therefore require not only practical scheduling changes, but also cultural shifts that normalise self-care and frame participation in NBIs as a valid and valuable use of time.

4.4.1.2 Environmental challenges: weather, terrain, and physical limitations.

Environmental conditions were frequently cited by participants as a barrier to engaging in outdoor or NBIs, particularly among older adults and those living with long-term health conditions. While nature was often described positively in general terms, participants also reflected on the realities of navigating physical discomfort, unpredictable weather, and inaccessible terrain. These environmental challenges played a central role in shaping whether NBIs felt viable or appealing.

Cold and wet weather, in particular, emerged as a key deterrent. For individuals with joint pain, fatigue, or mobility limitations, low temperatures were not simply uncomfortable but physically painful and demotivating: “Being cold doesn’t help me or my joints, so I try to keep warm.” (Service user, U09)

Some participants expressed scepticism about the health benefits of NBIs under adverse weather conditions. For those dealing with chronic pain or reduced resilience, the idea of improving wellbeing through outdoor exposure felt incompatible with the discomfort such environments could cause, one participant mentioned, “If it was torrential rain or hailstone, I would struggle to see how that would make me feel healthier or happier.” (Service user, U09)

Beyond weather, the physical nature of the terrain itself created barriers to participation. Several participants noted that uneven paths, long distances, or steep gradients discouraged or prevented involvement. One individual described the lasting physical consequences of navigating difficult ground:

> I mean the distance matters to me but it’s also how even the ground is… I find it harder to walk on uneven ground… I’m not that kind of supple anymore so

> that can really affect me, and I can be quite sore the next day. (Service user, U03)

These reflections illustrate that NBSPs, often promoted as broadly accessible and beneficial, can in practice exclude those with physical limitations, unless careful consideration is given to location, accessibility, and necessary adaptations. The appeal of nature does not negate the logistical and bodily realities many participants face.

Adopters echoed these concerns, providing additional context around how weather, clothing, and terrain limited participation in practice. In particular, they highlighted the economic challenges faced by individuals unable to purchase appropriate outdoor gear. One adopter recalled a participant who wished to attend more frequently but was held back by inadequate clothing for cold conditions:

> We run in all weathers other than in high wind or thunder and lightning... it's getting cold and so people don't necessarily have the right clothing to be able to access us daily and we did have one woman who came along, and she would, she would have loved to come but she just couldn't afford to buy the clothes that she would need. (Adopter, A02)

This quote demonstrates how financial barriers compound environmental ones. Even when an individual is motivated to attend, the absence of adequate clothing or footwear can make outdoor participation unfeasible. Without support or equipment provision, such exclusions are likely to persist.

Mobility challenges added a further layer of complexity. One adopter described how a participant with a walking aid still made the effort to attend sessions, despite the physical difficulty: "Obviously because we're outdoors most people have to be reasonably physically able to manage our terrain... there's a guy that comes at the moment who has sort of mobility issues, and he comes with a walker." (Adopter, A01)

While such determination was valued and admired, these examples underscore the physical strain and discomfort participants were often required to endure to take part in outdoor programming. Not all potential users were willing or able to make such efforts.

There were no specific references to weather or terrain in the social prescribers' accounts, suggesting this barrier may not always be visible at the referral stage. However, this absence points to a potential gap in the referral process, where environmental suitability and physical accessibility may not be routinely considered or communicated.

Taken together, these findings highlight that weather and terrain are not peripheral concerns, but central determinants of whether NBIs feel accessible, inclusive, and sustainable. Their impact is shaped by age, health status, mobility, and financial means. As such, programmes aiming to increase engagement with NBSPs must go beyond idealised messaging about the benefits of nature and address the practical conditions under which participation occurs. This may involve offering indoor alternatives, sourcing adaptive equipment, or tailoring activities to less physically demanding environments, especially for individuals who could benefit most from the intervention but are at risk of exclusion due to environmental constraints.

4.4.1.3 Transport and accessibility barriers. Transport emerged as a significant and multifaceted barrier to engagement, particularly for participants living in rural or semi-rural areas and those without access to a car. While often treated as a straightforward logistical concern, accounts, particularly from adopters, revealed a more complex picture. Transport challenges were shaped by an interplay of geographic distance, physical and mental health, emotional readiness, and financial insecurity.

Several adopters described scenarios in which infrequent or unreliable public transport limited participants' ability to access even nearby sessions. One adopter shared the experience of a participant who regularly walked several miles to attend an activity when the bus schedule failed to align:

> “We have one guy that comes to us who lives 3 or 4 miles away from our site, but the bus is every 2 hours. So, if he misses the bus then he actually walks and sets off walking so he can get to us. But obviously then he’s late and flustered and sort of anxious about that.” (Adopter, A01)

This example illustrates that transport is not only a matter of physical infrastructure, but also of emotional strain. For individuals experiencing anxiety, fatigue, or low confidence, the unpredictability of transport introduced significant psychological stress that could undermine their capacity to engage meaningfully.

Geographic isolation was another recurring theme. Even when services were located only slightly outside urban centres, participants with health concerns or low mobility could perceive them as inaccessible. One adopter explained how even minor distance from familiar areas could become a barrier for those with underlying vulnerabilities:

> People will say they can’t get to us, geographically we’re just outside of the town which for people that maybe don’t have any mental health issues or serious health issues might not think it’s a problem, but for anybody with a slight barrier, they will use that and say it’s because it’s not right in town. (Adopter, A03)

In addition to geographic and psychological barriers, financial constraints played a prominent role. Even modest contributions toward transport, such as small donations for a minibus, could be prohibitive for individuals experiencing financial hardship. One adopter described this frequently encountered issue: “If we offer them, you know the bus timetable, or even just saying can you make a donation to our minibus? They'll say they don't have the money to do that." (Adopter, A03)

This account illustrates how economic disadvantage often intersected with other access barriers. Even when subsidised or community-based transport options existed, they could remain inaccessible due to cost, scheduling, personal confidence, or unfamiliarity with travel routes. These cumulative challenges disproportionately affected those already navigating health issues, compounding their exclusion from preventative care and wellbeing interventions.

No service users in this study directly referenced transport difficulties, though the issue was widely reported by adopters who observed its impact on attendance and inclusion. Likewise, social prescribers did not explicitly discuss transport, suggesting that these structural barriers may remain largely invisible at the referral stage.

These findings reinforce that transport is not merely a background factor but a gatekeeper to access. NBSPs, which often rely on specific geographic settings such as parks, woodlands, or farms, may be especially vulnerable to this barrier. Without proactive planning to address transport needs, through location choice, mobile provision, or funding for travel, such interventions risk excluding those who stand to benefit most. To support equitable participation, SP pathways must consider not only what is being offered, but how, where, and for whom those services are realistically reachable.

4.4.2 *Staffing and Training*

Staffing and training challenges were consistently identified by adopters as critical barriers to both the accessibility and sustainability of nature-based and socially prescribed activities. These challenges extended beyond staffing levels to include concerns about preparedness, emotional resilience, and the availability of appropriate support for those working directly with participants.

Adopters frequently described the initial stages of participant engagement as particularly demanding. Many individuals referred into activities arrived with low confidence, heightened anxiety, or complex emotional needs. In these cases, the early contact point, whether a phone call, a walk to the venue, or the first session itself, was often decisive in determining whether someone would return. This relational work, which involved reassurance, encouragement, and emotional containment, was widely viewed as essential. Yet, adopters also noted that it was under-resourced and often undervalued.

> Once they get engaged and get involved and they realise it's not intimidating and it's actually fun… there's no expectation that you have to be, you know, mega outdoorsy... then they like it. But it's just getting them through the door that's the thing. So yeah, more people to support with that. (Adopter, A03)

Many adopters reported feeling unprepared for the intensity or complexity of participants' needs. While they were confident in facilitating group-based or nature-oriented activities, they often encountered situations involving trauma, social withdrawal, or deep-rooted anxiety. These needs stretched the boundaries of their roles and raised concerns about safety, appropriateness, and emotional strain, one explained:

> They will come along and then you can see that they're so anxious and you try and sort of do things that you think will help, but we just don't have the skills to know how to deal with that, that is frustrating. (Adopter, A02)

In the absence of formal mental health training or access to clinical supervision, staff were left to manage these situations with limited guidance. The emotional toll was compounded by unclear referral information and mismatched expectations between referrers and providers. One adopter described the resulting pressure and the effect it had on their willingness to continue:

> We've spoken to the social prescriber and said, you know, please be aware of our own limitations... it caused us immense stress to the point where now we debate whether to even continue... Do we need to retrain? We haven't got the capacity to do it. (Adopter, A01)

This example reflects a broader concern that surfaced across the data: a lack of shared understanding between those referring participants into services and those delivering them. When expectations were misaligned or information was missing, adopters found themselves managing risk without adequate preparation or support.

NBSPs introduced additional complexity. Some adopters highlighted the emotional intensity of supporting individuals in open, less structured environments where participants may feel exposed or uncertain. Unlike indoor activities with clear boundaries and facilities, outdoor settings required greater emotional agility from facilitators, especially when working with individuals experiencing distress. While the restorative potential of nature was frequently emphasised, the process of getting participants to a place where they could benefit from it was often demanding and resource intensive.

What emerges from these accounts is that staffing and training challenges are not just technical or operational, they shape the quality, accessibility, and safety of SP as a whole. For NBSPs in particular, where environments are less predictable and activities less formalised, the need for emotionally skilled, confident, and supported staff becomes even more critical.

4.4.3 *Developing trust: navigating uncertainty, self-doubt, and new environments*

Across both interviews and focus groups, trust emerged as a foundational factor influencing whether individuals felt able, willing, or motivated to engage in SP or community-based wellbeing activities. Unlike more tangible barriers such as transport or scheduling, trust was often described in emotional and relational terms. It was closely tied to self-confidence, previous experiences of judgment or exclusion, and participants' perceptions of the people and settings involved.

For service users, trust-related concerns frequently surfaced in relation to unfamiliar environments, particularly group settings or NBIs that involved being outdoors or with strangers. While the idea of being in nature was generally viewed positively, some individuals expressed hesitation about joining new groups in unfamiliar or exposed settings. This was particularly true for those experiencing low mood, anxiety, or who were uncertain about how they would be received, for whom the prospect of being observed or misunderstood could feel overwhelming.

These were not framed as simple preferences but as deep-seated emotional barriers. For some, even imagining attending a group activity brought up feelings of vulnerability, especially if past experiences had included being stigmatised, excluded, or unsupported.

Adopters and social prescribers reinforced these perspectives. They spoke about the emotional labour involved in building rapport with individuals who might be hesitant, fearful, or distrustful of services. Many emphasised that trust could not be presumed, particularly among individuals who had disengaged from, or felt uncertain or distrustful of, healthcare or community support. In the context of NBSPs, this concern was amplified by the physical and social openness of outdoor settings, which could feel less structured and harder to navigate for those with confidence or mental health challenges.

Several participants described how trust began not with the activity itself, but with who was delivering it, how they were approached, and what they expected. For many, it was the tone of the first conversation, a recommendation from a familiar person, or prior knowledge of the facilitator that made the difference between disengagement and attendance.

Trust, in this sense, was relational, built slowly and with care. Both adopters and prescribers described how consistency, patience, and small gestures, such as remembering a participant's name or offering to meet them in advance, helped to create emotional safety. They also noted how fragile this trust could be. Small disruptions, such as staff turnover or a miscommunication about an activity, sometimes caused individuals to withdraw entirely. For NBIs, these risks were heightened by the unpredictability of the environment, such as changing weather, unclear meeting points, or unfamiliar routes, all of which could generate anxiety and reinforce uncertainty.

Cultural familiarity and shared identity were also important. For some participants, especially women or those from minoritised communities, the question of whether they felt seen, understood, and welcomed shaped their overall sense of trust. In these cases, the facilitator's background, approach, or tone mattered as much as the activity or setting itself. This highlights the importance of cultural sensitivity and emotional attunement in fostering safe spaces for participation.

The subthemes that follow explore three key aspects of how trust was experienced and built:

- **Knowledge**, focusing on how uncertainty about people, settings, and group composition influenced initial willingness to engage
- **Confidence and self-belief**, exploring how internal self-doubt interacted with external reassurance to either facilitate or block participation
- **Permission**, examining how some participants, particularly women balancing multiple caregiving responsibilities, relied on professional endorsement to legitimise their own wellbeing needs

Together, these subthemes highlight that trust is not simply a matter of individual readiness. It is a dynamic, co-created process shaped by the quality of human connection, the accessibility of the environment, and the ability of services, especially NBSPs, to recognise and respond to the emotional realities that shape early engagement.

4.4.3.1 Knowledge. A key subtheme within the broader category of trust was the discomfort associated with unfamiliar environments, services, or group settings, particularly among service users who had not previously encountered SP. While many participants were familiar with being in nature and often spoke positively about its benefits, none had been referred into a social prescription, and most were unaware that healthcare professionals could link them to community-based or nature-focused activities. This limited awareness shaped how they responded to the idea of such offers, particularly when combined with uncertainty about who would be there, what the setting would be like, or how the activity would unfold.

These concerns were especially prominent among female participants aged 35 to 54, several of whom described feeling unsure about their current health status or had been informed that they were at risk of developing long-term conditions. For them, the psychological barriers to engagement were substantial. Worries about being judged, not fitting in, or feeling emotionally exposed created a sense of vulnerability that often-outweighed interest in the activity itself.

One participant offered a vivid account of how anxiety and overthinking shaped her decision-making:

> I mean you would probably think about who’s gonna to be there. And you know if they’re gonna judge you cause when you’re depressed that’s pretty much what you do... I think I would overanalyse all of it before I agree to it… and then I would probably still need someone. (Service user, U06)

This reflection illustrates how emotional readiness and familiarity, not just interest or availability, shaped willingness to engage. Even when an activity was perceived as beneficial, the prospect of entering a new social space, particularly without clear expectations or support, felt overwhelming.

By contrast, familiarity acted as a powerful enabler. Knowing the facilitator, or having friends already involved in the activity, gave participants the reassurance they needed to attend, one participant said, “Going to the running club was quite daunting at first however, um knowing you and like one or two other people that had signed up, that really helped.” (Service user, U11)

Other participants shared that trust in the person leading the session, based on past experience or perceived kindness, played a critical role in reducing fear and building confidence:

> I knew who the woman was who was running these classes… so I knew she was a very kind and compassionate person, and I knew that, you know, she was doing her Pilates training the years that I knew her. (Service user, U03)

These examples demonstrate that it was not necessarily the activity or the setting, nature-based or otherwise, that presented the barrier. Rather, it was the lack of information, predictability, or social familiarity that created a sense of uncertainty and hesitation.

This theme also resonated during the study’s recruitment efforts. Despite working with community organisations and a health psychologist to reach participants from a variety of backgrounds, there was limited uptake among individuals from minoritised ethnic communities. While this issue was not raised directly by participants, it reflects broader concerns around visibility, trust, and cultural familiarity in both research participation and service engagement.

In sum, participants were open to the idea of engaging in wellbeing activities, including those in natural settings. However, not knowing how or why they would be referred into these opportunities, and lacking a clear sense of what to expect, created emotional and relational barriers. Knowledge, therefore, played a central role in shaping trust, participants' understanding of the purpose, process, and value of social prescribing influenced whether they felt confident engaging with it. Trust, in this context, was not just about faith in the intervention but in the people, processes, and settings involved. In many cases, limited knowledge reduced trust, which in turn determined whether an offer felt accessible or not.

4.4.3.2 Confidence. A lack of confidence emerged as a recurring barrier to engagement, particularly among female service users aged 35 to 54. While many expressed genuine interests in community or NBIs, their motivation was frequently undermined by feelings of self-doubt, social anxiety, or fear of not fitting in. For these participants, the perceived risk of being judged, feeling out of place, or struggling to keep up created emotional hurdles that often outweighed any logistical concern.

Confidence, in this context, was not simply about physical ability or past experience, it reflected a person's comfort with navigating unfamiliar social spaces and the internal scripts that shaped their expectations. Participants described a sense of vulnerability when contemplating group activities, particularly those held outdoors or with others they did not know. Even when the idea of being in nature was appealing, the thought of entering an unfamiliar setting alone could feel overwhelming.

One participant recalled the emotional impact of surprising herself during a new activity, highlighting how external encouragement changed her internal narrative:

> I think I was quite taken aback that I could actually do golf, I thought my hand-eye coordination wouldn't be good enough… I was really pleased when the lady that was teaching me said that I could, well I would be able to play.

> And that's maybe what kept me going… I could improve, and I can still improve a lot. (Service user, U03)

This example illustrates how confidence was often built, not assumed, through supportive feedback and safe, validating experiences. In the context of NBIs, where participants might be asked to try something physically unfamiliar or socially challenging, this kind of encouragement played a crucial role. For many, confidence did not precede engagement; it emerged through gentle exposure, relational support, and positive feedback.

Adopters offered similar reflections. Many described receiving messages from individuals who were curious about joining but lacked the courage to take the first step. This early hesitation was seen as a pivotal moment, one where reassurance, warmth, and flexibility could either enable or discourage engagement.

> Often in the office we get messages… from people who say I've been wanting to come along but I've not had the confidence. I'm not brave enough to come along. So, we will... reassure them that they'll get a lovely warm welcome... And, if they really really can't then we... put them on the list for one-to-one support walk and talks… with a view to progressing them onto the groups. (Adopter, A05)

These one-to-one sessions, often outdoors, allowed participants to engage with nature at their own pace and in less socially demanding circumstances. Nature, in these cases, was not just the setting but a tool for easing emotional intensity, providing a calm, non-judgemental environment in which confidence could begin to grow.

However, adopters also described how the increasing demands on their time had made these personalised approaches harder to sustain. One noted that earlier in their service's development, a dedicated staff member could provide relational support from initial contact to group attendance, but that this model had become unfeasible as caseloads grew.

> When we first started, we had a lady placed in SP... she would go along and meet people in their houses and chat to them. Then she would be able to come along with them to their first meeting with us and provide support. But... I think now the workload has just got so huge that that's not been able to happen. (Adopter, A01)

This shift speaks to a broader tension in community-based services: the emotional labour needed to build confidence is often invisible and underfunded. Yet without it, many potential participants, especially those experiencing low self-esteem, social withdrawal, or mental health concerns, may never progress beyond initial interest.

Taken together, the findings suggest that confidence is not a static trait but a dynamic, relational process. It develops through exposure to emotionally safe environments, clear expectations, and encouraging relationships. Nature-based settings, when well-facilitated, can offer unique advantages in this regard: their informality, openness, and restorative qualities can reduce social pressure and help participants feel more grounded. However, the benefits of nature are not automatic, they depend on how activities are introduced, supported, and adapted to the emotional needs of those taking part.

Without appropriate scaffolding, even the most therapeutic natural setting can feel inaccessible. For individuals who are already uncertain or hesitant, the presence of a trusted person, gradual exposure, and emotional validation may be as critical as the activity itself.

4.4.3.3 Permission. For several female service users, particularly those balancing employment and caregiving responsibilities, the idea of taking part in a socially prescribed or community-based activity carried meaning beyond its physical or mental health benefits. These participants often described such engagement as a form of permission, an externally validated reason to prioritise their own wellbeing without guilt or justification. This sense of needing permission was especially relevant when activities involved stepping away from daily responsibilities or investing time in themselves, even when the activity was something as familiar and accessible as spending time in nature.

The emotional complexity of self-care was shaped by both structural constraints and internalised expectations. Many women described a deep sense of conflict about setting aside time for their own wellbeing. Even when they acknowledged the benefits of being outdoors or engaging in gentle activity, their default impulse was to prioritise work, family, or caregiving over personal restoration. In this context, endorsement from a health professional, whether a GP, social prescriber, or other trusted figure, had a transformative effect. It reframed participation not as indulgent or optional, but as necessary and legitimate.

> I think almost having permission to do something for self-care by a health professional… I would feel less guilty in spending that time doing an activity if I was told by a health professional that it's almost prescribed... At the minute, if my husband, for example, said go for a walk once a day... I'd say no, I've gotta look after my daughter or I've gotta do work. (Service user, U04)

This reflection highlights the moral and emotional tension that many participants faced. Informal encouragement, even from supportive family members, often lacked the authority to override ingrained feelings of guilt or duty. By contrast, professional recommendation served as a powerful form of social validation, one that conferred legitimacy on the act of caring for oneself.

Another participant described how professional referral increased her likelihood of following through with an activity, an effect not based on novelty, but on perceived importance:

> "It would make a difference being told… kind of recommended by a GP or a social prescriber. Yeah, because I think when it's sort of recommended by somebody like that, I think you do make more of an effort to do it rather than self-recommendation. (Service user, U02)

This theme was particularly relevant to NBIs, which were often seen as accessible, calming, and beneficial, but not always easy to prioritise without external endorsement. For these participants, being told that time in nature was good for their health, especially by a medical or wellbeing professional, helped justify the choice. In this way, the "prescription" did not necessarily introduce something new, but rather authorised something they already believed was helpful, yet rarely allowed themselves to prioritise.

These insights reflect broader gendered dynamics, particularly among women in caregiving roles. While partners or peers sometimes encouraged them to spend time on their own wellbeing, this support rarely carried the same weight as a formal referral. The authority of the healthcare system, particularly when framed as a therapeutic or medicalised intervention, allowed them to reframe self-care as responsible, justified, and even necessary.

This subtheme reinforces the broader importance of trust in the referral process. For participants already stretched thin or accustomed to putting others first, a trusted recommendation offered not just information but emotional permission. This dynamic was particularly relevant for NBIs, which may otherwise appear optional or recreational. When framed by professionals as meaningful, evidence-based, and beneficial, these same activities gained credibility and priority. This also echoes participants' reflections in Section 4.4.3.1 on the importance of knowing and trusting the person facilitating the activity, which further shaped their comfort with and openness to participation.

Taken together, the findings suggest that how activities are introduced is as important as what is offered. For individuals navigating multiple demands, professional endorsement can bridge the gap between awareness and action, helping to legitimise choices that serve their own health. In this sense, permission is not just about access; it is about reframing value, elevating self-worth, and creating space, emotionally and practically, for nature-based wellbeing to take root.

4.4.4 *What Makes Participation Meaningful*

Beyond overcoming practical or psychological barriers, participants placed significant importance on the quality and personal meaning of the activity itself. It was not enough for an activity to be available or accessible; it needed to resonate in some way. For some, this meant enjoyment or relaxation. For others, it was about feeling useful, being with others, or engaging in something that reflected their values or identity. These findings suggest that engagement is driven not only by the removal of barriers, but also by the emotional, social, and purposeful elements of the experience.

For many service users, enjoyment was not a superficial preference, it played a defining role in whether an activity was seen as worthwhile or burdensome. Participants described assessing the personal value of an experience before committing to it, weighing what it offered emotionally, socially, or practically. This was especially important for those who felt uncertain or ambivalent. If an activity aligned with a person's interests, values, or identity, it was more likely to be embraced. If not, even well-promoted or well-structured offers might be met with disengagement or polite refusal.

Preferences varied considerably. Some individuals were motivated by peaceful, low-stimulation environments, often found in nature or solitary settings. Others valued social interaction, skill-building, or a sense of contribution. These differences illustrate that a one-size-fits-all approach to SP is unlikely to succeed. What mattered most was not just participation, but the felt experience of being there: whether it resonated emotionally, provided a sense of achievement, or simply felt like time well spent.

Adopters and social prescribers recognised the importance of tailoring activities to the individual. Several described how engagement was stronger when activities were either co-designed or deliberately matched to a participant's needs or preferences. In this context, the role of the practitioner was not just to refer or facilitate, but to listen, interpret, and help identify experiences that held meaning for that person. This relational, person-centred approach was seen as essential to supporting longer-term engagement.

The following subthemes explore three distinct dimensions of how participants experienced and evaluated their involvement:

- Sense of purpose, describing the value of contributing, achieving, or guiding others.
- Disconnecting, reflecting the appeal of nature or quiet spaces as a break from daily pressures.
- Social interaction, focusing on the role of belonging, group dynamics, and connection.

Together, these subthemes show that how an activity feels, what it offers beyond structure, and how it fits into an individual's life all play critical roles in shaping not only initial engagement but sustained involvement over time.

4.4.4.1 Sense of purpose. For some service users, particularly men aged 35 to 64, a sense of having a meaningful role or purpose emerged as a key factor influencing their engagement with socially prescribed activities. Enjoyment alone was often not sufficient.

Instead, activities were more appealing when they offered personal relevance, a sense of contribution, or an opportunity to take on an active role. Participants were drawn to experiences that allowed them to help others, mentor, care for animals, or take on informal leadership, rather than simply attend as recipients.

One participant described how walking with animals in nature offered not only emotional relief but also a form of therapeutic responsibility, a chance to engage without judgement or pressure:

> Get some men who feel like they've, you know, there's not a lot of good things going on and just getting them up the hills with me and the pack of dogs and just seeing how they get on, cause dogs don't judge you. (Service user, U06)

This quote illustrates how non-verbal, non-clinical environments, especially those involving animals and natural surroundings, can create emotionally safe spaces for men who may not feel comfortable with traditional support formats. These activities provided value not because they asked participants to open up, but because they allowed them to simply be present, act, and contribute without explanation.

Several participants, particularly men aged 35 to 64, described a strong desire for roles that felt useful or contributory. Enjoyment alone was not enough, participation needed to involve a sense of agency, relevance, or informal leadership. For these individuals, being part of something meaningful often meant doing something with or for others, not simply attending. One participant spoke about wanting to collaborate with a service, rather than just receive support: "I have spoken to someone… about um maybe doing a collaboration. Like kind of have them down here and help in some way of that sense." (Service user, U05)

This preference for co-productive roles reflects a broader theme across several interviews: that socially prescribed activities were most engaging when they allowed participants to contribute, share skills, or feel needed. These roles offered a sense of pride, continuity, and purpose, particularly for those who did not view themselves as needing help but still wanted to take part in something beneficial.

A notable pattern across several male participants was a reluctance to describe themselves as needing support. Even when they acknowledged stress, disconnection, or low mood, their focus often shifted to others: supporting friends, recommending services, or caring for family. This tendency may reflect wider social norms around masculinity, independence, and reluctance to engage with formal help-seeking. In these cases, the language and structure of an activity made a significant difference. When men were offered roles that allowed them to lead, guide, or contribute, they were more likely to engage.

One implementer shared an example of how meaningful involvement could also benefit older men, who often face distinct risks of isolation and loss of identity: “I think he was in his early 90s, and he was like giving expert advice so you could see he was like feeling important and feeling appreciated and it was so nice to see.” (Implementer, I01)

This account reinforces the idea that purposeful activity supports not just participation, but also emotional wellbeing, social connection, and the preservation of identity. For older participants in particular, opportunities to share experience or offer advice created a sense of value and continuity, fostering belonging in ways that standard service models may not.

Taken together, these reflections highlight that a sense of purpose is often central to successful engagement. particularly among men. What matters is not only what the activity involves, but how it makes someone feel: useful, competent, and valued.

Programmes that offer informal, flexible, and co-productive roles may be especially effective in engaging participants who are hesitant to identify as needing support. By inviting individuals to lead, collaborate, or contribute, SP can become more than a referral pathway, it can become a meaningful experience rooted in identity, agency, and contribution.

4.4.4.2 Disconnecting. For many service users, particularly those aged 25 to 44 and those in full-time employment, the opportunity to disconnect from the pace and pressure of daily life emerged as a powerful motivator for engaging with nature-based or socially prescribed activities. These participants described their routines as fast-paced, screen-saturated, and emotionally demanding. In this context, time spent in nature was not simply recreational, it was restorative.

Nature was consistently described not just as a setting, but as a refuge, a place to temporarily escape from the noise, urgency, and overstimulation of modern life. Participants associated these spaces with feelings of calm, clarity, and emotional relief. The value of being able to unplug, even briefly, was articulated in personal and emotionally resonant terms, one participant explained: “There’s nothing more relaxing than going up in the hills with a pack of dogs and just ignoring the world.” (Service user, U06)

This sense of intentional withdrawal was not viewed negatively. Rather, it was described as an active and positive choice, a conscious effort to step back from constant connectivity and re-centre emotionally. Participants used terms such as “tranquil,” “not busy,” and “a break away*”* to describe the feelings evoked by outdoor experiences. These stood in sharp contrast to the rhythm of their everyday lives, which often involved multitasking, rapid transitions, and limited time for reflection.

For these participants, NBSPs offered more than exercise or social connection, they provided emotional space. The ability to be “off the grid,” even temporarily, was experienced as a kind of mental reset. It allowed participants to slow down, shift perspective, and reconnect with a calmer, more grounded version of themselves. This experience was not secondary to engagement; it was often the primary draw.

The emotional appeal of stillness and solitude was especially relevant for those experiencing what participants described as feeling overwhelmed, under pressure, or in need of a break from the demands of daily life, captured by one participant who spoke of wanting to simply “ignore the world” (Service user, U06). These individuals were not necessarily seeking structured group interaction or measurable outcomes. Instead, they valued the quietness, spaciousness, and absence of demands that outdoor environments provided. Being alone, or simply away from pressure, was not a side benefit, but the essence of what made the activity meaningful.

This subtheme highlights the importance of recognising internal, reflective motivations in the design and delivery of socially prescribed activities. While goals such as physical health or community connection may underpin many interventions, these findings suggest that downtime, detachment, and disconnection are also central to wellbeing for some participants. Nature, in these cases, becomes more than a setting, it is an active agent of recovery, offering participants permission to pause, breathe, and reset.

To meet these needs, SP programmes may need to provide space for quiet engagement, not just active or social participation. Incorporating flexible, low-stimulation options can make wellbeing services more inclusive, particularly for those whose main need is not connection, but rest.

4.4.4.3 Social Interaction. The social aspects of wellbeing activities were described as both deeply beneficial and occasionally challenging, depending on the individual’s needs, preferences, and previous experiences. For many service users, particularly those recovering from illness or experiencing social isolation, the opportunity to connect with others in a supportive environment was central to what made an activity feel worthwhile. SP was often viewed not only as a route to improved health, but as a gateway to confidence, community, and renewed identity.

For some, this pathway extended far beyond initial participation. One adopter described how participants had transitioned from service users to volunteers, and in some cases, to paid staff roles:

> “We’ve got about 60%... volunteers who have come through and used and been community members and we’ve now got some who have come on to be staff members as well... that is a true pathway from being unwell... to employment.” (Adopter, A05)

This example highlights the long-term impact of structured but flexible social environments. For individuals who had experienced exclusion, inactivity, or disconnection, being part of a consistent, collaborative space offered more than social contact, it supported growth, purpose, and belonging. These groups provided routine, roles, and meaningful interactions that helped people reconnect with both others and themselves.

However, the social dimension of group activities was not universally positive. Some participants, and several adopters, described how group dynamics could shift over time in ways that created unintended barriers. In particular, when a group became close-knit or dominated by confident individuals, newer or more vulnerable members could feel excluded or hesitant to join.

> It did end up attracting quite a lot of people that maybe didn’t need the support… it was just becoming like a certain group of people who were really

> close... it was also getting clique... and that’s a barrier to the ones that really need it. (Adopter, A03)

This reflection illustrates a key tension in group-based wellbeing models. While consistency and familiarity can create strong social bonds, they can also unintentionally reinforce exclusion, especially for those who are anxious, marginalised, or less socially confident. What was designed as an inclusive space can gradually become exclusive if group dynamics are not carefully monitored and supported.

Across the data, it became clear that the value of social interaction is highly individual. For some, being part of a group was motivating and affirming, it provided encouragement, accountability, and a renewed sense of belonging. For others, particularly those with social anxiety or negative past experiences, the same setting could feel emotionally overwhelming or inaccessible.

What emerged was a strong case for choice and flexibility. While some individuals thrive in group contexts, others may benefit from one-to-one engagement, small group settings, or more gradual introductions. Adopters noted that offering varied formats was essential in meeting the full range of participant needs.

These findings underscore that social interaction is not inherently positive or negative, it is context-dependent and relational. Its success relies on thoughtful design, inclusive facilitation, and an awareness of group dynamics over time. The most effective programmes were those that did not assume connection, but actively nurtured it, recognising that inclusion requires ongoing effort and sensitivity.

Ultimately, the social element of these activities can be transformative, supporting recovery, confidence, and a pathway to purpose. But it can also pose challenges if left unmanaged. Maintaining a welcoming and balanced social environment is essential in ensuring that all participants, not just the confident or connected, can benefit from what these activities have to offer.

4.4.5 *Expectations and Capacity*

Expectations and capacity emerged as a prominent theme in the focus groups with both social prescribers and adopters. These discussions revealed a persistent and often frustrating mismatch between what is envisioned in the SP model and what is practically achievable within current systems of delivery. This gap was especially apparent in relation to waiting times, unclear referral processes, and divergent understandings of the scope and limitations of community-based services.

Social prescribers spoke of being stretched across large caseloads, with limited time to build relationships, provide continuity, or follow up in a consistent and meaningful way. Meanwhile, adopters described similar pressures, particularly in terms of the emotional and logistical support required for individuals with complex needs. They frequently reported being under-resourced and over-extended, often having to balance compassionate intentions with operational constraints such as funding, staff time, and training.

Across both groups, the issue was not just the volume of referrals or service demand, but the misalignment of assumptions and expectations between different stakeholders. Tensions were noted between referring professionals and community providers, between staff and participants, and even within multidisciplinary teams (MDT). These mismatches contributed to a shared sense of strain and uncertainty, where individuals and organisations were eager to help, but often felt ill-equipped or unsupported in doing so sustainably.

This theme sets the stage for a deeper examination of how unspoken or poorly managed expectations can create barriers to both effective delivery and meaningful engagement. The following subtheme explores how these tensions specifically manifest in the referral process, and in assumptions about what SP can realistically offer.

4.4.5.1 Expectations. Unclear or unrealistic expectations emerged as a consistent concern among both social prescribers and adopters and were frequently described as a barrier to delivering safe, effective, and person-centred care. This subtheme captures a disconnect between what stakeholders imagined SP could offer, and the practical constraints faced by those delivering or coordinating services, particularly within voluntary and community sector (VCS) organisations.

Adopters often described receiving referrals with little or no background information yet were expected to support individuals who were navigating complex psychological, emotional, or social challenges. Without adequate preparation or context, staff felt unprepared and unsupported forced to respond to needs beyond the intended scope of the service.

> “We’ve spoken to the social prescriber and said, you know, please be aware of our own limitations... it caused us immense stress to the point where now we debate whether to even continue... Do we need to retrain? We haven’t got the capacity to do it.” (Adopter, A01)

This reflection underscores the pressure and professional uncertainty placed on staff when service boundaries are not respected or clearly communicated. While adopters expressed a shared desire to help, they also emphasised the need for realistic role expectations and transparent communication, both with prescribers and with participants themselves.

In addition to incomplete referrals, some adopters reported that participants arrived without being adequately prepared for what the activity involved. In these cases, participants expected one-to-one therapeutic support or clinical care, only to find an informal group or peer-led session. This mismatch often led to confusion, disappointment, or early disengagement.

> “You’ll get loads of emails from people saying... here’s their contact details. Can you get in touch with them to come and join the gardening group? And you’re like, it’s just not as easy as that… There’s still some misunderstanding about how we can support people and what the benefits are.” (Adopter, A03)

This quote reflects a broader concern that misaligned expectations erode trust, place additional strain on community staff, and create barriers to sustained engagement. When participants expect a particular kind of support, and find something different, they may feel let down or uncertain about the value of the experience.

Social prescribers also acknowledged the difficulties of working within a system where community provision is fragmented and changeable. Many described struggling to stay up to date with service availability, particularly when working across multiple practices or geographic areas. This made it difficult to ensure that referrals were timely, appropriate, and fully informed. “Some organisations are just so busy they have to stop sort of taking referrals… funding only lasts for so long and then they disappear... it’s a constant, constant job.” (Implementer, I02)

This insight reflects a wider systemic challenge. When services shift or close due to funding cycles, and when communication between referrers and providers is inconsistent, prescribers are left with limited confidence in the referral options available. This can contribute to a cycle of unmet expectations, both for staff and for service users.

Taken together, these accounts point to a critical need for improved communication, shared understanding, and clearer role boundaries within the SP ecosystem. The aspiration for personalised, holistic care was shared across the stakeholder groups, but the infrastructure to deliver it was often stretched, fragmented, or unclear.

Without honest conversations about what is feasible and appropriate, there is a risk of burnout for staff, disappointment for participants, and a dilution of the core values that SP aims to uphold.

4.4.6 *Understanding Impact: Whose Outcomes Matter?*

Across the dataset, participants and stakeholders spoke about outcomes in ways that reflected their unique positions within the SP pathway. For some, particularly service users, outcomes were understood through personal experiences of change, including improved mood, connection, and confidence. For others, such as adopters and social prescribers, the focus was shaped by the demands of evaluation, accountability, and evidence. While there was widespread belief in the value of nature-based and community interventions, the way success was defined, measured, and recognised varied significantly. These differences highlight a deeper tension between funder-driven performance metrics and the more relational, subjective, and sometimes invisible outcomes that participants themselves valued. This overarching theme explores these contrasting perspectives, illustrating how stakeholder roles influence not only how impact is assessed, but whose experiences are prioritised in the process.

4.4.6.1 Personal change and perceived value. As part of the interviews, participants were asked whether they had personally spent time in nature or engaged in NBI’s, regardless of whether they were formally prescribed. They were also invited to consider whether NBSPs might be beneficial for themselves or others, and how such activities might support wellbeing. Across these reflections, participants described a range of emotional and physical responses, from feeling calmer or more focused, to reconnecting with themselves or others. These responses were often subtle but highly meaningful, particularly for those juggling competing demands or experiencing stress, low energy, or a need for emotional breathing space.

4.4.6.2 Personal change and perceived value. As part of the interviews, participants were asked whether they had personally spent time in nature or engaged in NBIs, regardless of whether these had been formally prescribed. They were also invited to consider whether NBSPs might be beneficial for themselves or others, and how such activities might support wellbeing. Across these reflections, participants described a range of emotional and physical responses, from feeling calmer or more focused, to reconnecting with themselves or others. These responses were often subtle but highly meaningful, particularly for those juggling competing demands or experiencing low mood, anxiety, or social withdrawal.

Rather than framing benefits in clinical or measurable terms, participants often described how the activities made them feel, referencing improved mood, energy, emotional balance, and mental clarity. NBIs in particular were valued for providing distance from the demands of daily life. Many participants highlighted how walking or simply spending time outdoors allowed them to reset, reduce overstimulation, and regain a sense of perspective.

One participant reflected on this shift, stating, "I always feel so much better after I've been out for a walk. Even if I didn't feel like going, by the time I've done it, I'm glad I did." (Service user, U01)

Others emphasised the cognitive benefits, with one participant explaining, "It's just quiet, it's not busy, it makes you feel like you can breathe again." (Service user, U06)

These experiences were not always dramatic or transformative, but they were real and tangible for the individuals involved. For some, being able to think more clearly, feel more grounded, or simply experience a break from routine represented a significant outcome. This emotional reset helped participants feel more in control and better equipped to manage daily challenges, even when other aspects of their lives remained unchanged.

Adopters and implementers, who observed participants over time, described similar changes. While not always easy to capture through formal outcome tools, signs such as improved consistency in attendance, increased openness, and greater social confidence were often interpreted as meaningful indicators of wellbeing. As one adopter noted. "You can see people who come in really quiet, they’re nervous, and they start turning up every week, they start chatting more, and then suddenly they’re doing a role in the group or asking to volunteer." (Adopter, A05)

These accounts reinforce that personal change was often experienced gradually and relationally. The outcomes that mattered to participants were those that helped them feel more like themselves, even if they were not immediately visible or measurable. This suggests a need for outcome frameworks that recognise emotional and experiential indicators of progress, rather than relying solely on standardised metrics.

4.4.6.3 Evidence and expectations: measuring for funders. While service users often described outcomes in terms of how they felt, calmer, more motivated, or better able to cope, adopters highlighted a contrasting reality shaped by the requirements of external funders. For many community and voluntary sector organisations, outcome measurement was not just a means of capturing change, but a condition of funding. Grant-based programmes were expected to provide evidence of impact, typically through pre-determined frameworks designed by funders rather than by the organisations or participants themselves.

This resulted in a wide range of evaluation practices across providers. Some adopters worked within flexible, person-centred models, using wellbeing tools designed to reflect participants’ satisfaction with different areas of life. One described a holistic approach that allowed participants to reflect subjectively on their own progress:

> "We use those wheels which have got physical health and fitness, financial wellness, work, life purpose, social connection, mental and emotional health, personal growth and skills, creativity and connection with nature… we ask people to form judgement on how happy they are with those areas of their life, not how well they're doing, but how happy they are." (Adopter, A01)

Others, however, described working within stricter frameworks, where outcome measurement was reduced to numeric reporting on attendance, outputs, or referral numbers: "We have our KPI trackers… and so I know how many people have participated. It's basically all the numbers… that will go to our funders." (Adopter, A04)

These contrasting approaches reflected the fragmented funding landscape in which most community services operate. With each funder requiring different metrics, timelines, or reporting tools, adopters frequently found themselves duplicating efforts or juggling multiple systems, often without the capacity or infrastructure to do so efficiently. As one explained:

> "All of our services are funded by different project funders… and they all have baseline surveys… something midway and something at the end… How they feel about life, do they feel they've got skills to offer… do they feel more confident… less isolated… at the end hoping they feel more independent." (Adopter, A03)

In addition to the administrative strain, adopters also raised concerns about the impact of these tools on participants. Several reported that widely used wellbeing measures, such as the Warwick-Edinburgh Mental Wellbeing Scale, were experienced as repetitive, overly clinical, or burdensome by service users, especially those already engaged with multiple services, one adopter shared, "One of the difficult things is… the Warwick Edinburgh… everybody uses it, but all participants have said 'oh thank goodness you're not using that. I am fed up to the back teeth of filling it in everywhere I go.'" (Adopter, A02)

Taken together, these accounts point to a deeper tension between the needs of funders for standardised, measurable data and the more personal, relational ethos of SP. While demonstrating effectiveness is clearly important, the emphasis on formalised metrics can inadvertently obscure or devalue the nuanced and subjective experiences that participants identify as meaningful. In many cases, adopters described seeing powerful changes, increased confidence, reduced isolation, new friendships, that were difficult to quantify but central to participants' wellbeing.

There was broad agreement that a more balanced approach is needed. Several adopters called for co-produced evaluation methods that would allow participants to define what success looks like and reflect on change in their own words. These might include more narrative-based feedback, simplified tools, or participatory models that align better with the relational and person-led nature of the work.

This subtheme illustrates how evaluation, while essential for sustainability and advocacy, can also become a constraint when overly shaped by external pressures. Without a clear alignment between what is measured and what matters to participants, there is a risk that important outcomes go unrecognised. A more coherent, collaborative, and participant-informed approach may offer a way forward, one that respects the needs of both funders and the people at the heart of the intervention.

4.4.6.4 Communicating value and motivating engagement. While some participants described clear and immediate benefits from taking part in socially prescribed or NBIs, others, particularly those who rated their health as "good" or did not see themselves as needing support, expressed uncertainty about whether such interventions were relevant to them. For this group, the idea of taking part was not dismissed outright, but engagement often depended on how clearly the purpose and benefits were communicated.

Several participants explained that, although they were open to the idea of wellbeing activities, they would be more motivated if they understood the evidence or rationale behind them. One participant described this need for clearer communication: "If somebody had told me the reasons why it would help and the evidence behind it, and if I had the understanding and knowledge of how it would actually help then I personally would be more likely to do it." (Service user, U04)

This reflection suggests that, for some individuals, particularly those not currently in crisis or not identifying as at risk, participation required a stronger case. The activity needed to be presented not simply as something available, but as something worthwhile. In these instances, perceived value was closely linked to trust in the source of information and confidence in the anticipated benefit. Participants wanted to feel assured that their time would be well spent, especially when balancing work, family, and other responsibilities.

In contrast, social prescribers often described using a more conversational, person-led approach to referrals. Rather than persuading participants of the value of an activity, they focused on uncovering interests and co-creating options in response to what individuals enjoyed or needed:

> It would only come up if they said they were interested in it. I don’t try and force my ideas… if you ask someone straight away what they’re interested in, what their hobbies are, what they like to do… no one’s ever sat there and said ‘oh I don’t know. (Implementer, I01)

This model placed trust in the participant’s intrinsic motivation and framed the link worker as a facilitator rather than an expert. Another prescriber emphasised the importance of connecting current choices with past positive experiences: "We have to find out what's worked before, what hasn't worked, what they enjoy doing and then try and link them in with that thing that they enjoy doing." (Implementer, I02)

While this non-directive approach was valued for its emphasis on autonomy, it may not have provided the clarity needed for those who were undecided, unfamiliar with the concept of SP, or hesitant to engage. For some, a more educational framing, one that explicitly outlined the purpose and benefits of the activity, might have increased their willingness to participate.

This subtheme highlights an important nuance in how SP is communicated and received. The way an offer is framed can significantly influence uptake, particularly among those who are not in acute need but who may benefit from early or preventative support. Balancing curiosity-led, person-centred engagement with clearer messaging around potential outcomes may help bridge this gap and ensure that the perceived value of participation is understood and meaningful to a wider range of individuals.

4.4.6.4 Clarity and Credibility: Communicating the Value of SP. Among participants who rated their health as generally “good” and who did not view themselves as needing formal support, there was a recurring desire for more clarity about the expected benefits of engaging in SP (SP) or related wellbeing activities. While these individuals were not opposed to participation, their motivation to engage appeared to hinge on understanding how and why the activity might be of value. Without a clear rationale, they expressed hesitation, not as a form of rejection, but as a result of uncertainty.

> If somebody had told me the reasons why it would help and the evidence behind it, and if I had the understanding and knowledge of how it would actually help then I personally would be more likely to do it. (Service user, U04)

This quote captures a broader pattern across the data: for some participants, interest alone was not enough. They wanted to know what specific outcomes they could expect and why a given activity would be worth their time, particularly in the context of busy lives or competing responsibilities. In this way, perceived relevance and outcome expectancy became key determinants of engagement.

In contrast, social prescribers described a person-led approach to engagement. Their aim was not to promote specific activities, but to support participants in identifying what was meaningful to them. Conversations focused on personal interests, past experiences, and what participants felt comfortable doing.

> It would only come up if they said they were interested in it. I don't try and force my ideas… if you ask someone straight away what they're interested in, what their hobbies are, what they like to do… no one's ever sat there and said 'oh I don't know. (Implementer, I01)

Another implementer echoed this view, noting the value of grounding suggestions in a person's own narrative: "We have to find out what's worked before, what hasn't worked, what they enjoy doing and then try and link them in with that thing that they enjoy doing." (Implementer, I02)

While this personalised model was well-aligned with the ethos of SP, the findings suggest that it may need to be complemented by stronger communication, particularly when participants are unsure about the role or purpose of the intervention. A purely exploratory conversation may not meet the needs of individuals who are hesitant or less familiar with the concept of wellbeing support. In these cases, a more explicit framing of benefits could make the difference between curiosity and disengagement.

This has important implications for nature-based interventions. Despite widespread evidence of their benefits, the value of NBSPs is not always self-evident to participants, particularly those who do not already spend time outdoors or associate nature with wellbeing. Without clear messaging about how being in nature can support mental clarity, reduce stress, or improve emotional balance, these interventions risk being perceived as vague or low priority. Offering examples or evidence-based explanations during referral conversations could help bridge this gap.

In summary, while the non-directive, person-centred ethos of SP remains a core strength, some participants may require clearer information about expected benefits in order to engage. This is particularly true for those who do not see themselves as 'in need,' but who may still stand to benefit. For NBIs to reach a broader audience, they may need to be framed not just as pleasant or accessible, but as purposeful and effective.

4.5 Discussion

This study explored how service users, implementers, and adopters perceive the barriers and enablers to engaging with socially prescribed activities, particularly nature-based interventions. These findings respond directly to Research Question 3 by identifying the ways in which different stakeholder groups experience and interpret the conditions that influence participation. The discussion also situates the findings within the wider literature and theoretical context outlined in Chapter 1, particularly the biopsychosocial model of health, behaviour change theory, and the structural and psychosocial determinants of NCDs.

A consistent theme across participants was the influence of practical constraints such as time scarcity, transport difficulties, and environmental challenges. These findings mirror wider evidence that caregiving responsibilities and work pressures often prevent individuals, particularly women, from engaging in preventative health behaviours (Kelly & Barker, 2016). Similarly, inequities in transport access are recognised as a key social determinant of health that both reflect and reproduce wider inequalities in access to services (Buck & Gregory, 2018; Marmot et al., 2020). The deterrent effect of weather and terrain is also consistent with research showing that the restorative potential of green space is undermined when accessibility is limited by mobility, equipment, or cost (Jennings et al., 2016; Shanahan et al., 2015). These findings therefore reinforce the biopsychosocial model (Engel, 1977; Wade & Halligan, 2017) by showing that environmental and logistical barriers are not peripheral but central determinants of engagement with NBSPs.

Critically, these structural barriers do not operate in isolation from psychological ones. Time scarcity and transport difficulties can reduce an individual's sense of agency and reinforce feelings of guilt about prioritising their own health, while the financial cost of appropriate clothing or equipment can compound low self-efficacy and reduce perceived feasibility even before participation begins (Marmot et al., 2020; Jennings et al., 2016). In this way, structural constraints actively shape the psychological conditions under which engagement is considered, making it insufficient to address either domain in isolation.

Adopters in this study reported feeling underprepared for the psychological and emotional needs of participants, particularly in open and less structured outdoor environments. This resonates with Fixsen et al.'s (2020) findings that unclear referral processes and weak inter-organisational collaboration place significant strain on voluntary sector staff. Interpreted through SCT (Bandura, 1986), these challenges can be understood as undermining facilitator self-efficacy, their confidence in their ability to support participants effectively. Low self-efficacy among providers risks reducing the quality of engagement, mirroring findings that confidence is a precondition for sustained behaviour change, not only in individuals but also in those delivering interventions (Zamani-Alavijeh et al., 2019). These findings highlight that staffing and training are not operational details but critical determinants of whether NBSPs can be delivered safely, inclusively, and sustainably.

The role of trust also emerged as foundational in shaping participants' willingness to engage. Service users, particularly women aged 35–54, described how endorsement from a professional provided them with "permission" to prioritise their own wellbeing. This aligns with the Health Belief Model (Janz & Becker, 1984; Rosenstock, 1974), which emphasises the importance of cues to action in prompting preventive behaviour. At the same time, participants stressed that unfamiliarity with settings or facilitators often acted as a barrier, reinforcing the importance of cultural familiarity and relational safety in service design (Husk et al., 2020). Trust, therefore, was not only about individual readiness but also about systemic processes of validation, endorsement, and social legitimacy.

Participants further emphasised that meaningful engagement depended not only on the removal of barriers but also on the quality and personal resonance of the activities. This reflects SDT, which identifies autonomy, competence, and relatedness as core drivers of sustained motivation (Deci & Ryan, 2000; Richardson et al., 2021). For some, motivation stemmed from enjoyment and social connection, while for others it was linked to purpose, contribution, or solitude. These differences reinforce the need for flexible, person-centred approaches to activity design. The restorative qualities of nature described by participants resonate strongly with ART (Kaplan & Kaplan, 1989) and SRT (Ulrich, 1983), which explain how natural settings can support cognitive recovery and emotional regulation. However, this study shows that these benefits only become accessible once structural and relational barriers are addressed, underscoring that exposure to nature is a necessary but not sufficient condition for wellbeing gains.

The study also revealed differences in how outcomes were valued across stakeholder groups. Service users described subtle but meaningful changes such as improved mood, calmness, and confidence, while adopters and implementers emphasised the need to evidence impact through attendance data or validated wellbeing scales. This disconnect echoes Bickerdike et al.'s (2017) critique that SP research risks privileging funder-driven metrics over the experiential outcomes participants value most. It also reflects the broader tension, identified in Chapter 3, between evidence hierarchies that prioritise standardisation and the inherently relational, contextual nature of NBSPs. Developing evaluation frameworks that recognise both quantitative outcomes and experiential change remains a key challenge for the field.

It should be noted, however, that most service users in this study had not experienced a formal social prescription into a nature-based intervention, and their accounts therefore reflect hypothetical or informal engagement rather than lived experience of referral. This limitation is considered further in Section 4.6, but it is important to acknowledge here that while this absence constrains the scope of the findings, the triangulation of perspectives across service users, implementers, and adopters provides valuable insight into the barriers and opportunities that shape the likelihood of uptake and sustained participation.

Taken together, these findings support the biopsychosocial model by illustrating how engagement is simultaneously shaped by structural conditions, psychological processes, and social relationships (Engel, 1977; Wade & Halligan, 2017). They also demonstrate the explanatory power of behaviour change theories: the Health Belief Model helps to explain how cues to action and perceived risk influence uptake (Rosenstock, 1974), SCT highlights the importance of proxy agency and self-efficacy (Bandura, 1986), and SDT sheds light on the role of intrinsic motivation and relatedness in sustaining participation (Deci & Ryan, 2000). Environmental psychology frameworks such as ART and SRT further contextualise participants' reports of restoration in natural settings (Kaplan & Kaplan, 1989; Ulrich, 1983).

By integrating these theories with lived experience, this study moves beyond describing barriers to explain why engagement succeeds or falters in practice. It extends the evidence base summarised in Chapter 3 by grounding theoretical models in the everyday realities of potential service users and providers. In IM terms, these findings identify the specific determinants that must be addressed in subsequent programme design, including flexibility in provision, investment in staff training, relational support for confidence-building, and clear communication of purpose and benefits (Bartholomew Eldredge et al., 2016). Ultimately, the study shows that SP has considerable potential to address NCD risk, but only if interventions are designed in ways that reflect the lived complexities of the communities they aim to serve.

4.6 Strengths and Limitations

This study offers several important contributions to the understanding of engagement with nature-based social prescriptions. One of the key strengths lies in its multi-stakeholder design, which enabled a nuanced exploration of how service users, implementers, and adopters perceive the barriers and enablers to engagement. Examining these perspectives together provided a more complete picture of the relational and systemic dynamics within SP pathways. The findings were also interpreted through established behavioural theories and environmental psychology, ensuring a theoretically grounded analysis with practical relevance. The use of reflexive thematic analysis, supported by the researcher's insider knowledge of healthcare and voluntary sectors, generated rich insights that align closely with real-world complexities.

Several limitations should also be acknowledged. First, the sample lacked ethnic diversity, which limits the generalisability of findings across cultural groups. Despite targeted efforts to recruit through community organisations, sustained relationship-building would have been needed to achieve greater inclusion. Second, most service users had not received a formal social prescription into a nature-based intervention. Their reflections therefore drew on hypothetical or informal experiences rather than direct encounters with structured referral pathways. While this constrains the extent to which the data capture the full process of prescription and follow-up, the triangulation of perspectives across users, implementers, and adopters nonetheless provides valuable insight into the barriers that shape uptake and sustainability. This gap also highlights a priority for future research: longitudinal studies with individuals who have received formal referrals are needed to examine how perceptions evolve across the stages of engagement. Finally, while the qualitative design allowed for in-depth exploration of experience, it does not establish causal or generalisable conclusions. The researcher's dual role as both insider and analyst may also have influenced interpretation, although reflexivity was used to enhance transparency and credibility.

4.7 Conclusion

This chapter has presented findings from a qualitative needs assessment that explored the barriers and enablers to engaging with socially prescribed activities, with a particular focus on nature-based interventions. The analysis brought together the perspectives of service users, implementers, and adopters to examine how engagement is shaped by personal, social, and systemic factors. These findings have directly addressed Research Question 3, which asked whether different stakeholder groups perceive different opportunities and barriers to using social prescriptions, specifically NBSPs. The results show that while certain barriers, such as time constraints, emotional readiness, and access to transport, are shared across groups, others vary significantly by stakeholder role, gender, and perceived health status. For example, service users often described needing external validation or emotional permission to prioritise their wellbeing, while implementers and adopters focused on practical limitations in referral processes and service capacity.

Taken together, the findings also contribute to Research Questions 1 and 2 by identifying how biopsychosocial and behavioural outcomes are influenced not just by participation in NBSPs, but by the complex conditions that shape whether individuals feel able to engage in the first place. These insights reinforce the importance of aligning SP pathways with evidence-based theories of behaviour change and with the lived experiences of those most affected by NCD risk. The study has shown that engagement is unlikely to occur in the absence of trust, emotional safety, clear communication, and structural support.

In summary, this study has established a grounded understanding of the conditions under which nature-based interventions are perceived as valuable, accessible, and feasible by those involved in using, referring to, and delivering them. Together with the findings from the umbrella review presented in Chapter 3, this chapter completes Step 1 of the IM process: a comprehensive needs assessment informed by both the existing evidence base and stakeholder perspectives. By integrating the theoretical frameworks introduced in Chapters 1 and 2 with participants lived experiences, the research provides a critical foundation for developing a contextually grounded, theory-informed intervention. The next chapter will build on this foundation to identify specific behavioural determinants, practical barriers, and enabling conditions. In doing so, it will translate these insights into actionable strategies to design and deliver interventions that effectively support engagement with NBSPs.

Chapter 5 From Needs Assessment to Intervention Design

5.1 Chapter Overview

This chapter marks the transition from understanding the problem to designing a practical and theoretically grounded solution. Building on the findings from Study 1 (umbrella review) and Study 2 (qualitative needs assessment), it presents Steps 1 through 3 of the IM framework (Bartholomew Eldredge et al., 2016). Chapter 4 addressed Research Question 3 by identifying the key barriers and enablers to engaging with SP and NBSPs as perceived by service users, implementers, and adopters. These findings, alongside insights from the literature review and behavioural theory, now inform the development of a tailored intervention

The purpose of this chapter is to show how empirical evidence and stakeholder perspectives were systematically integrated with theoretical models of behaviour change to develop a logic model of the problem, matrices of change objectives, and a set of potential strategies. This stepwise process lays the foundation for designing an intervention that is both context-sensitive and implementation-ready. Through this approach, the chapter aims to move beyond descriptive insight toward structured intervention planning that responds directly to the conditions identified in earlier stages of the research. Table 6 provides an overview of this structure, mapping each step to its corresponding chapter sections and key outputs, before each component is examined in detail.

Table 6

Overview of the Intervention Mapping process as applied in Chapter 5

Step	IM Process	Chapter Section	Components	Key Output
1	Needs assessment (PRECEDE model)	5.2	Quality of life & health burden (5.2.1) Behavioural & environmental causes (5.2.2) Behavioural diagnosis (5.2.3) Determinants of behaviour & environment (5.2.4)	Logic model of the problem (Figure 5-1)
2	Matrices of change objectives & logic model of change	5.3	Theoretical frameworks (5.3.1) Performance & change objectives Theory-based methods & practical applications (5.3.2)	Logic model of change (Figure 5-2)
3	Theory-based methods & programme design	5.4	Stakeholder & evidence synthesis Intervention recommendations (5.4.1) Chapter summary & next steps (§5.5)	Intervention concept

Note. IM = Intervention Mapping; PRECEDE = Predisposing, Reinforcing and Enabling Constructs in Educational/Ecological Diagnosis and Evaluation (Green & Kreuter, 2005). Steps 4–6 of IM (programme production, adoption planning, and evaluation planning) fall outside the scope of this doctoral project and are discussed in 7.6.

5.1.1 Applying the Intervention Mapping Framework.

This chapter translates the findings from study 1 (umbrella review) and study 2 (qualitative needs assessment) into a practical intervention design aimed at improving engagement with SP and NBSPs. To achieve this, Steps 1–3 of the IM framework were applied (Bartholomew Eldredge et al., 2016).

As outlined in Chapter 2, IM provides a systematic, theory-driven, and participatory process for developing health promotion interventions. Its structured approach ensures that programme components are grounded in evidence and explicitly linked to behavioural determinants and mechanisms of change. Within this thesis, IM offers a coherent pathway for operationalising stakeholder insights into actionable strategies that address the psychological, social, and organisational factors identified in Study 2.

The full IM process comprises six iterative steps: (1) needs assessment, (2) matrices of change objectives, (3) theory-based methods and practical applications, (4) programme production, (5) adoption and implementation planning, and (6) evaluation planning. The focus here is on Steps 1–3, reflecting the applied intent and scope of a doctoral project while establishing a foundation for future implementation and evaluation work.

IM’s multi-level structure aligns closely with the biopsychosocial model underpinning this research, recognising that engagement with SP and NBSPs is shaped not only by individual motivation but also by interpersonal relationships, referral processes, and wider system contexts. Accordingly, this chapter begins with a needs assessment structured using the PRECEDE model (Green & Kreuter, 2005), followed by the development of a logic model of change and the selection of theory-informed methods and practical applications that together form a prototype intervention concept.

5.2 Needs Assessment (Intervention Mapping Step 1)

This section presents the needs assessment conducted as part of Step 1 of the IM framework, which serves as the foundation for developing a theory- and evidence-informed intervention (Bartholomew Eldredge et al., 2016). Drawing on empirical findings from Study 1 and Study 2, alongside relevant literature, the assessment aimed to identify key health issues, behavioural and environmental influences, and their modifiable determinants contributing to low engagement with SP and NBSPs.

To structure this process, the PRECEDE component of the PRECEDE–PROCEED model was applied (Green & Kreuter, 2005). PRECEDE, Predisposing, Reinforcing, and Enabling Constructs in Educational Diagnosis and Evaluation, is widely recommended in IM as a diagnostic framework for systematically exploring quality of life issues, health problems, behavioural and environmental causes, and their psychosocial and contextual determinants (Bartholomew Eldredge et al., 2016). This structure enables researchers and practitioners to map the multi-level influences on behaviour in a comprehensive and theory-informed way, facilitating the development of a logic model of the problem that is both empirically grounded and contextually relevant (Fernández et al., 2002; Kok et al., 2016).

5.2.1 *Quality of Life and Health Burden*

Findings from Study 1 and Study 2 indicated that low engagement with SP and NBSPs contributes to significant health burdens, including poor mental health, social isolation, and reduced psychological wellbeing. These issues are associated with diminished biopsychosocial functioning, increased healthcare utilisation, and lower quality of life, particularly among individuals experiencing social disadvantage or complex health needs (Prince et al., 2007; WHO, 2022).

The relevance of NBSPs to the prevention and management of NCDs is supported by established environment-health theories, which were discussed in depth in Chapter 2. Stress Recovery Theory (Ulrich, 1983) and ART (Kaplan & Kaplan, 1989) offer explanatory mechanisms for the physiological and psychological benefits associated with nature exposure. These include reductions in stress, improvements in cognitive function, and enhanced emotional regulation, factors which are increasingly recognised as contributing to NCD risk profiles. While these theories do not address behavioural determinants directly, they provide a conceptual rationale for selecting NBSPs as a key intervention modality and help to clarify the expected outcomes linked to environmental engagement.

5.2.2 *Behavioural and Environmental Causes*

The PRECEDE-informed needs assessment begins by identifying the overarching health burden and quality of life issues associated with low engagement. Behaviourally, many individuals do not access SP or NBSPs, nor do they engage with other forms of community-based support. This pattern was observed across both empirical studies. Environmentally, barriers include inconsistent referral pathways, low awareness of interventions among healthcare providers, limited-service coordination, stigma, and systemic constraints on access. These environmental and service-level challenges inhibit individuals from engaging in support that could otherwise enhance their wellbeing.

5.2.3 *Behavioural Diagnosis*

Drawing on the findings from Study 2, presented in Chapter 4, the behavioural and environmental barriers mapped in the logic model reflect the core themes identified in that study. The combined evidence from Study 1 and Study 2, supported by the wider literature (Fixsen et al., 2005; Husk et al., 2019), indicates that low engagement is not solely attributable to individual decision-making. Rather, it arises from a complex interplay of personal, structural, and systemic factors. Themes such as ‘Resources’ (Section 4.4.1), ‘Trust’ (4.4.3), and ‘Staffing and Training’ (4.4.2) were synthesised into a behavioural diagnosis that provides the foundation for the logic model of the problem and the development of targeted intervention strategies in later stages of the IM process (Bartholomew Eldredge et al., 2016). The resulting logic model (Figure 5-1) illustrates the interconnections between behavioural, environmental, and psychosocial determinants identified through the needs assessment and serves as a visual summary of the diagnostic process.

5.2.4 *Determinants of Behaviour and Environment*

Key modifiable determinants were identified from both the empirical data and relevant theoretical frameworks. These included motivational constructs (e.g., self-efficacy, perceived benefit), relational factors (e.g., trust in practitioners), and structural barriers (e.g., lack of accessible information or support). Determinants such as limited knowledge and awareness, low confidence in navigating referral systems, and perceptions of stigma were highlighted by potential service users, while implementers and adopters emphasised barriers including resource constraints, funding insecurity, and inconsistent referral pathways.

Importantly, these structural and psychological determinants are not independent categories. Structural barriers such as under-resourced services and fragmented referral pathways directly constrain the relational conditions under which psychological determinants like trust and self-efficacy can develop: when staff lack capacity to provide consistent, personalised support, service users are less likely to build the confidence or sense of permission needed to engage (Fixsen et al., 2005; Husk et al., 2019). Conversely, psychological barriers such as anxiety or internalised guilt can make structural obstacles feel insurmountable even when they are objectively manageable. This bidirectional interaction informed the design of intervention components that address both levels simultaneously, rather than targeting structural and psychological determinants separately.

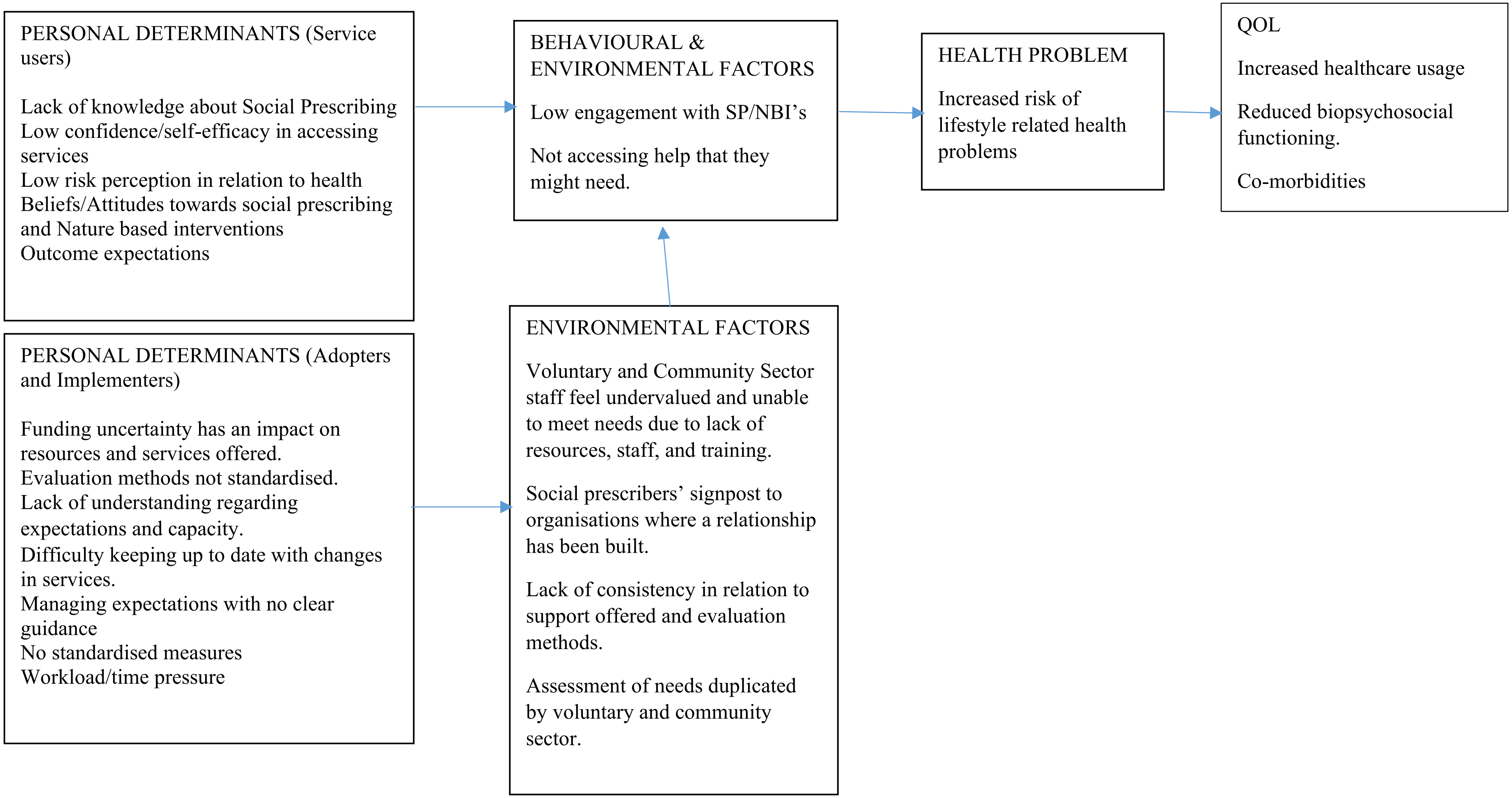
To strengthen their theoretical grounding, these determinants were considered in relation to established behaviour change frameworks. SCT (Bandura, 1997) offered explanatory constructs such as self-efficacy and outcome expectations, which aligned with users' lack of confidence and uncertainty about benefits. The HBM (Glanz et al., 2015; Rosenstock, 1974) provided a lens for interpreting perceptions of risk, severity, and intervention value, helping to explain ambivalence about engaging with social prescriptions and NBSPs.

In addition, the TDF (Cane et al., 2012; Michie et al., 2005) was used to ensure comprehensive coverage of potential influences across behavioural and environmental levels. Practically, this involved reviewing the inductively derived themes from Study 2 and the wider literature against the 14 TDF domains. Each determinant was then classified within the most relevant domain, for example, workload and resource pressures were captured under environmental context and resources; uncertainty about the appropriateness of NBSPs aligned with beliefs about consequences; and concerns about relational trust mapped onto social influences. This process served two functions: it provided a structured way of organising determinants, and it acted as a diagnostic check for completeness, ensuring that important domains such as reinforcement, emotion, and professional role identity were not overlooked.

Together, this triangulation of stakeholder perspectives, empirical evidence, and behavioural theory produced a determinant set that was both empirically grounded and theoretically comprehensive. These determinants then provided the foundation for developing performance and change objectives in the subsequent stages of IM process.

Figure 5-1

Logic model of the problem (structured by PRECEDE domains)



PERSONAL DETERMINANTS (Service users)

Lack of knowledge about Social Prescribing
Low confidence/self-efficacy in accessing services
Low risk perception in relation to health
Beliefs/Attitudes towards social prescribing and Nature based interventions
Outcome expectations

PERSONAL DETERMINANTS (Adopters and Implementers)

Funding uncertainty has an impact on resources and services offered.
Evaluation methods not standardised.
Lack of understanding regarding expectations and capacity.
Difficulty keeping up to date with changes in services.
Managing expectations with no clear guidance
No standardised measures
Workload/time pressure

BEHAVIOURAL & ENVIRONMENTAL FACTORS

Low engagement with SP/NBI’s

Not accessing help that they might need.

ENVIRONMENTAL FACTORS

Voluntary and Community Sector staff feel undervalued and unable to meet needs due to lack of resources, staff, and training.

Social prescribers’ signpost to organisations where a relationship has been built.

Lack of consistency in relation to support offered and evaluation methods.

Assessment of needs duplicated by voluntary and community sector.

HEALTH PROBLEM

Increased risk of lifestyle related health problems

QOL

Increased healthcare usage

Reduced biopsychosocial functioning.

Co-morbidities

5.3 Logic Model of Change

Building on the diagnostic insights described above, the logic model of change (Figure 5-2) articulates how targeted behavioural and environmental modifications are expected to lead to improved health outcomes. This model presents a structured pathway linking specific behavioural determinants to actionable performance objectives and outlines the mechanisms through which these objectives are expected to be achieved (Bartholomew Eldredge et al., 2016).

The logic model serves as a bridge between theory and practice, translating the broad problem of low engagement with SP and NBSPs into a sequenced pathway of changes that are both theoretically informed and empirically grounded. Rather than offering general recommendations, the model specifies which behavioural and contextual factors must be addressed, how they interrelate, and what outcomes are likely to result from change.

At the individual level, the model emphasises the importance of strengthening service users' sense of agency and promoting sustained engagement with NBSPs. To support this, several key behavioural determinants were identified from both empirical data and behavioural theory, including service users' knowledge of SP and NBSPs, their self-efficacy, perceptions of susceptibility to and severity of long-term health risks, expectations about potential outcomes, and attitudes toward nature-based solutions. These factors align with constructs from established models such as the HBM and SCT (Bandura, 1997; Glanz et al., 2015).

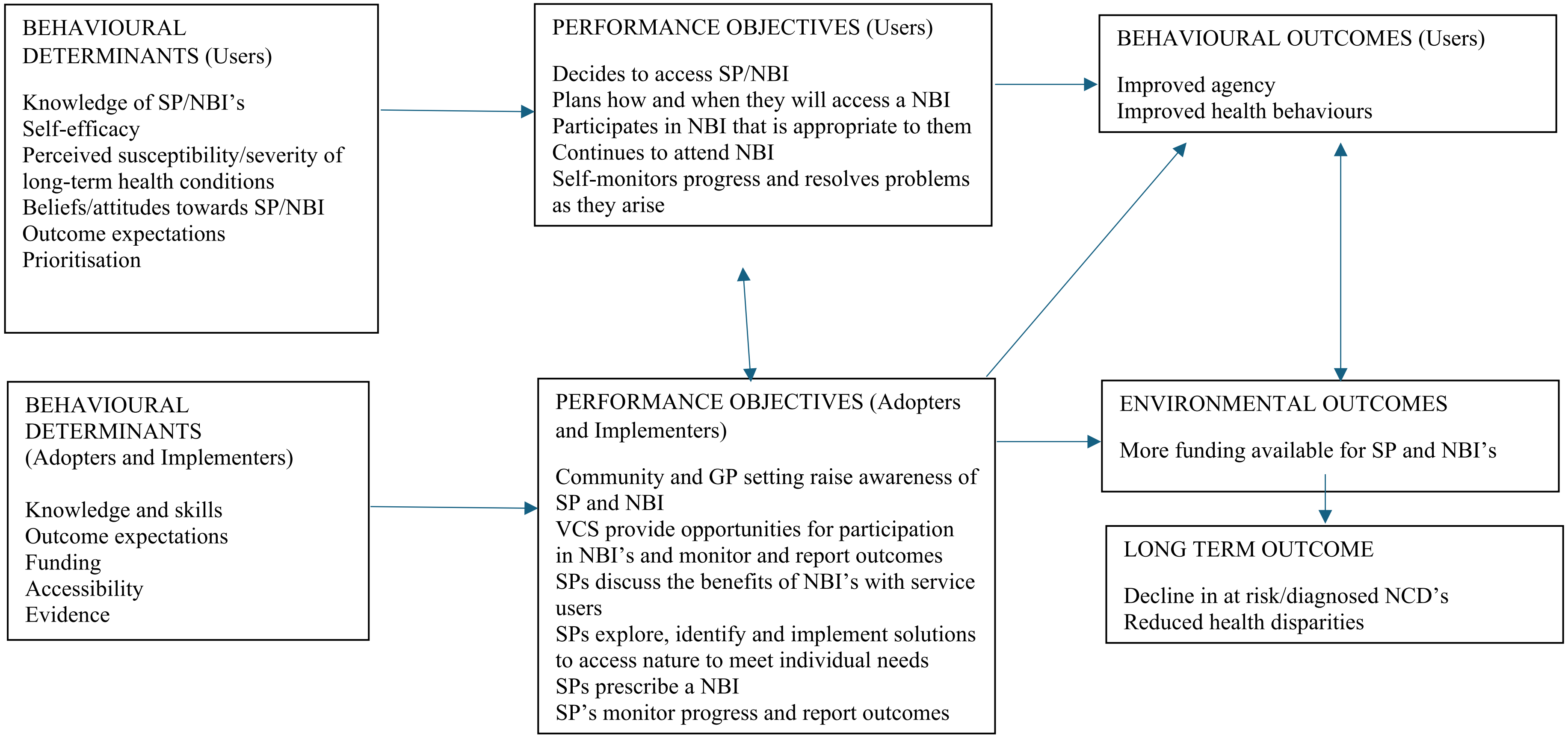
The performance objectives describe the specific behaviours that service users are expected to demonstrate. These include making the decision to access SP or an NBSPs, planning how to participate, attending a suitable programme, continuing engagement over time, and monitoring personal progress. Each objective is explicitly connected to one or more of the identified determinants. For example, a service user’s decision to access an NBSPs may depend on whether they understand what the intervention involves, believe it is relevant to their situation, and anticipate a positive outcome.

Environmental performance objectives were developed to reflect the role of those involved in implementation. These include actions by social prescribers and VCSE staff to raise awareness of NBSPs within communities, prescribe appropriate interventions, and facilitate ongoing support and outcome monitoring. To achieve these, specific change objectives were identified, targeting determinants such as professionals’ knowledge and skills, perceptions of funding stability, clarity of supporting evidence, and the accessibility of services (Cane et al., 2012; Michie et al., 2011). This dual focus on both individual and environmental factors is critical. It acknowledges that behavioural change does not occur in isolation but within systems that can either support or inhibit engagement. For instance, even highly motivated service users may struggle to access NBSPs if referral pathways are unclear or if local services lack the capacity to meet demand.

By clearly linking behavioural and environmental objectives to their underlying determinants and associated outcomes, the logic model provides a comprehensive and theory-based framework for guiding intervention design. It identifies what needs to change, who should be involved in the process, and through which mechanisms that change is expected to take place.

Figure 5-2

Logic model of change



5.3.1 *Theoretical Frameworks*

The intervention development process in this thesis was guided by the theoretical frameworks introduced in Chapter 2, which together provide a structured understanding of the determinants of behaviour and the mechanisms through which NBSPs may support health. These frameworks were applied within the IM approach, ensuring that strategies were explicitly linked to established theory and evidence while remaining responsive to the barriers and enablers identified in the needs assessment.

SCT (Bandura, 1986, 2001) and the HBM (Rosenstock, 1974) were used to explain how individual beliefs, perceptions, and forms of agency influence engagement with prescribed activities. ART (Kaplan & Kaplan, 1989) and SRT (Ulrich, 1991) provided insights into how natural environments can reduce stress and restore cognitive capacity, thereby creating conditions that support behaviour change. The BPS model (Engel, 1977) acted as the overarching framework, ensuring that biological, psychological, and social determinants were considered in combination rather than isolation. Finally, the TDF (Cane et al., 2012) was employed as a supplementary tool to check that all relevant behavioural domains had been considered.

To demonstrate how these frameworks were operationalised, Table 5 summarises their key constructs, the insights highlighted by existing research, and the specific contributions of this thesis. The table provides a selective integration rather than a comprehensive mapping, focusing on those constructs most relevant to social prescribing and nature-based interventions. This integration illustrates how theoretical perspectives shaped the interpretation of findings and informed the development of practical strategies.

Table 7

Integration of theoretical constructs, existing research, and findings from this thesis

Theory / Framework	Key constructs	What existing research shows	What this thesis adds
Social Cognitive Theory (SCT)	Self-efficacy	Higher self-efficacy is linked to uptake of health behaviours (Bandura, 1986, 2001).	Demonstrates how link workers and peer groups build confidence in navigating SP systems, extending self-efficacy beyond the activity itself.
Health Belief Model (HBM)	Perceived benefits; perceived barriers; cues to action	SP uptake linked to perceived value of activities and reduction of access barriers (Rosenstock, 1974).	Shows that cues to action (e.g. GP referrals, encouragement from link workers) are often weak; structural barriers undermine perceived benefits.

Theory / Framework	Key constructs	What existing research shows	What this thesis adds
Attention Restoration Theory (ART)	Cognitive recovery, involuntary attention	Nature exposure improves attentional capacity and reduces fatigue (Kaplan & Kaplan, 1989).	Confirms relevance for people with long-term conditions; group-based NBSPs enhance restoration through shared social experience.
Stress Reduction Theory (SRT)	Affective and physiological calming	Nature exposure reduces stress and promotes emotional regulation (Ulrich, 1991).	Adds evidence that NBSPs provide safe, low-demand environments where stress reduction supports engagement and confidence.
Biopsychosocial model (BPS)	Interaction of biological,	Widely applied as a holistic model of health (Engel, 1977).	Shows NBSPs uniquely address biological, psychological, and social determinants simultaneously; highlights integration challenges in SP pathways.

Theory / Framework	Key constructs	What existing research shows	What this thesis adds
	psychological, social factors		
Intervention Mapping (IM) with TDF	Systematic linking of determinants to strategies	IM used internationally; TDF ensures coverage of 14 behavioural domains (Bartholomew Eldredge et al., 2016; Cane et al., 2012).	Novel integration of IM and TDF in NBSP design; used to check completeness of determinants and guide intervention planning.

Taken together, these insights provided a coherent foundation for identifying change objectives and selecting appropriate theory-based methods, as described in Section 5.3.2 below.

5.3.2 *Theory-Based Methods and Practical Applications*

During Step 3 of the IM process, specific theory-based methods were selected to translate the logic model's change objectives into practical, evidence-informed strategies. These methods were chosen to address the determinants identified in Step 1 and are grounded in well-established behavioural theories.

SDT (Ryan and Deci, 2000) will be used to support the development of strategies that enhance intrinsic motivation and user autonomy. This will be particularly relevant for individuals who may be ambivalent or uncertain about engaging with SP or NBSPs. Drawing on the theory's emphasis on autonomy, competence, and relatedness, strategies such as MI and co-produced action planning are proposed as suitable methods. These approaches are intended to build internal motivation by aligning participation with individuals' values, providing supportive guidance, and fostering a sense of ownership over the process (Miller and Rollnick, 2012).

Goal-Setting Theory (Locke and Latham, 1990) will inform the inclusion of structured planning and progress monitoring techniques. In order to help users move from intention to action, specific, measurable, achievable, relevant, and time-bound (SMART) goals are proposed. These techniques will be matched to objectives related to programme attendance and sustained engagement and will be supported by facilitator training in goal-setting principles.

Self-Regulation Theory (Carver and Scheier, 1982) is expected to support strategies that encourage reflective monitoring and adaptive behaviour over time. This will include the use of self-monitoring tools such as journals or checklists, regular feedback on progress, and prompts for reflection built into sessions or follow-up communications.

The Trans-Theoretical Model of Change (Prochaska and DiClemente, 1983) will guide the development of stage-matched messaging and support options that reflect individuals' varying levels of readiness to engage with interventions. Recognising that service users may enter the process at different stages, such as pre-contemplation, contemplation, or preparation, the intervention design will include content tailored to each stage. For example, informational materials will aim to raise awareness and address common doubts among those not yet ready to act, while more structured planning tools will be offered to those who are preparing to engage.

Together, these two frameworks provided the conceptual foundation for developing theoretically grounded performance and change objectives. The TDF also played an important role by offering a comprehensive structure for identifying a broad range of potential behavioural determinants during the needs assessment phase. In this way, the TDF supported systematic coverage of possible influences on engagement, while frameworks such as SCT and the HBM were then applied to give explanatory depth and to guide the specification of performance and change objectives. Additional behavioural theories were subsequently drawn upon to inform the selection of theory-based methods, as described in the next section

Table 8

Summary of Key Behavioural and Environmental Determinants (drawn from Study 1, Study 2, and theory) and Implications for Intervention Design

Theme (from Chapter 4)	Key Findings	Underlying Determinant	Implications for Intervention Design
Resources (4.4.1)	VCSE services underfunded, staff overstretched.	Structural barrier to access and continuity	Capacity-building and system-level coordination
Staffing & Training (4.4.2)	Inconsistency in staff knowledge and referral processes	Professional confidence and standardisation issues	Training modules and referral resources
Trust (4.4.3)	Users are skeptical or unaware of SP/NBSPs	Low engagement due to relational mistrust	Modelling and motivational interviewing to build trust.
Permission (4.4.3.3)	Users unsure if NBSPs are a "valid" form of care	Ambivalence about appropriateness of intervention	Consciousness-raising, autonomy-supporting tools

5.4 Transition to Intervention Development

The structured analysis and theoretical integration presented in the preceding sections provided the foundation for designing the proposed intervention. Rather than moving directly from qualitative themes to strategies, each intervention component was developed by applying theory-informed methods to the performance and change objectives derived from the needs assessment (Tables 7–9). Insights from both the umbrella review (Study 1) and stakeholder perspectives (Study 2), combined with established behavioural theories, were systematically translated into practical strategies through the IM process.

As outlined in Chapter 2, other classification systems such as the Behaviour Change Technique taxonomy (BCTTv1; Michie et al., 2013) and the Behaviour Change Intervention Ontology (BCIO; Michie et al., 2020) provide valuable frameworks for specifying and coding intervention content. However, this thesis followed the IM taxonomy of behaviour change methods (Kok et al., 2015), which directly links theoretical determinants to practical applications and defines parameters for their effective use. This approach aligns with the structured, theory-driven design process adopted here and guided the translation of theoretical and empirical insights into applied intervention strategies.

This process began with a systematic review of the matrices of change objectives (Tables 7–9), ensuring that each performance objective was addressed using evidence-based methods aligned with relevant theoretical constructs. Determinants such as awareness, self-efficacy, and opportunity were mapped to appropriate IM behaviour change methods (Kok et al., 2015), including consciousness raising, modelling, goal setting, facilitation, and MI. Consciousness raising refers to strategies that increase awareness or insight about health behaviours and their consequences, helping individuals recognise the relevance of change (Prochaska & DiClemente, 1983). Modelling involves demonstrating desired behaviours through relatable examples, allowing individuals to observe and internalise effective coping or engagement strategies (Bandura, 1986). Goal setting supports self-regulation by encouraging individuals to establish specific, attainable, and measurable targets for behaviour change (Locke & Latham, 1990). Facilitation encompasses environmental or social actions that make the desired behaviour easier to perform, such as providing resources, guidance, or access to opportunities (Kok et al., 2015). Finally, motivational interviewing (Miller & Rollnick, 2013) is a collaborative conversational method designed to strengthen intrinsic motivation and resolve ambivalence about change through empathy, autonomy support, and reflective dialogue.

Together, these methods operationalise the behavioural determinants identified in the needs assessment, ensuring that intervention components address both individual motivation and structural opportunity within the social prescribing context.

Stakeholder engagement remained central throughout this stage. Insights from service users, link workers, and VCSE providers informed both the content and delivery of intervention components, ensuring that strategies were theoretically robust, contextually relevant, and acceptable to diverse stakeholders. For example, the promotional video addressed emotional readiness and trust concerns highlighted in Theme 4.4.3 (“Developing Trust”), while the Nature Needs Assessment targeted motivational uncertainty and the need for legitimised self-care discussed in Theme 4.4.3.3 (“Permission”). Similarly, issues of sustainability and referral inconsistency (Themes 4.4.2 and 4.4.5) guided the development of the provider-facing training and stakeholder forum. Importantly, each component was kept at concept level at this stage, deliberately leaving space for stakeholders to critique, adapt, and shape the intervention through the co-design process reported in Chapter 6.

Finally, the selected methods were operationalised into practical applications tailored to specific target groups. Table 10 presents an overview of this translation process, showing how performance objectives and determinants were addressed through theory-based methods and stakeholder-informed delivery strategies. While earlier logic models grouped prescribers and adopters together for simplicity, they are separated here to reflect their distinct roles in practice: prescribers (e.g., link workers, GPs) focus on referral and patient-facing engagement, whereas adopters (e.g., VCSE staff) deliver and sustain interventions. Distinguishing these groups at the application stage enabled more precise tailoring of methods and strategies to their respective responsibilities.

Table 9

Matrices of Change Objectives -Potential Service Users

Performance Objective (PO)	Knowledge (K)	Skills/Self-Efficacy (SE)	Outcome Expectations (OE)	Attitudes/Beliefs (AB)
PO1. Decide to access SP/NBI	K.1 Understands purpose, benefits, and access steps	_	OE.1 Expects benefits from SP/NBI	AB.1 Believes others like them use SP/NBI
PO2. Plan how/when to participate	K.2 Describes steps and info needed to engage	SE.1 Confident in accessing services	_	_
PO3. Participate in a suitable NBI	K.3 Knows what an NBI is and why it's beneficial	_	OE.2 Expects long-term health benefits	_
PO4. Continue to attend	_	SE.2 Confident in continuing engagement	_	AB.2 Believes continued participation is valuable
PO5. Self-monitor progress	K.4 Knows how to track progress and overcome barriers	SE.3 Able to self-monitor and problem-solve	_	AB.3 Believes monitoring progress is important

Table 10

Matrices of Change Objectives - Implementers (Social Prescribers)

Performance Objective (PO)	Knowledge (K)	Skills/Self-Efficacy (SE)	Outcome Expectations (OE)	Attitudes/Beliefs (AB)
PO6. Raise awareness of SP/NBI	K.5 Can explain SP/NBI benefits and processes	–	OE.3 Expects engagement to increase	–
PO10. Discuss NBI benefits with users	K.6 Can explain health benefits of NBI	–	–	–
PO11. Identify and solve access barriers	–	SE.6 Confident supporting barrier-solving	OE.6 Expects barriers can be overcome	AB.6 Willing to support users to succeed
PO12. Prescribe a NBI	–	SE.7 Able to prescribe and share info	–	–

Table 11

Matrices of Change Objectives - Adopters (VCSE staff)

Performance Objective (PO)	Knowledge (K)	Skills/Self-Efficacy (SE)	Outcome Expectations (OE)	Attitudes/Beliefs (AB)
PO7. Provide opportunities for NBI	–	SE.4 Can provide NBI	OE.4 Expects health improvements	AB.4 Willing to track/report outcomes
PO9. Communicate about SP/NBI	–	SE.5 Shares info confidently	OE.5 Expects communication improves uptake	AB.5 Believes info sharing helps access
PO13. Monitor/report outcomes	K.7 Knows how to evaluate and address barriers	SE.8 Can monitor and manage issues	OE.7 Expects improved funding/resource outcomes	AB.7 Values monitoring and evaluation

Table 12

Linking Change Objectives to Methods and Practical Applications

Change Objectives	Theoretical Method	Description of Method	Proposed Practical Application	Programme Component
K.1, K.2, K.3, SE.1, OE.1, OE.2, AB.1, AB.2	Consciousness Raising (Health Belief Model, Trans-Theoretical Model)	Increase awareness and perceived relevance of NBI engagement	Co-designed educational video featuring personal stories and expert insights on SP/NBI benefits	*Nature-Based Intervention (NBI) Introductory Video*
	Modelling (Social Cognitive Theory)	Show relatable role models demonstrating engagement steps	Footage of individuals planning and participating in NBIs	*Video & Role Model Segments*
K.6, SE.5, OE.5, AB.5, SE.6, SE.7, OE.6, AB.6	Verbal Persuasion (Social Cognitive Theory, Self-Regulation Theory)	Use of encouraging, empowering messages to build confidence and intention	Training for social prescribers/VCSE to use motivational scripts and reflective questions	*Discussion Materials + Verbal Prompts*

Change Objectives	Theoretical Method	Description of Method	Proposed Practical Application	Programme Component
	Motivational Interviewing (Self-Determination Theory)	Strengthen internal motivation and autonomy through dialogue	One-on-one sessions using MI to explore personal barriers and goals	*Link Worker Motivational Toolkit*
K.5, OE.3, OE.4, SE.5, OE.5, AB.5, K.6, SE.6, OE.6, AB.6	Modelling (Social Cognitive Theory)	Inspire implementers through examples of success	Video case studies showing how SP/NBI helps both users and providers	*Provider-Facing NBI Training Video*
SE.5, OE.6	Facilitation (Social Cognitive Theory)	Help individuals identify challenges and strategies	SPs guide users through planning tools and problem-solving exercises	*Nature Needs Assessment Tool*
SE.4	Modelling (Social Cognitive Theory)	Highlight best practices in delivering NBIs	Video segments showing practical, diverse NBI delivery approaches	*Staff Development Resources*

Change Objectives	Theoretical Method	Description of Method	Proposed Practical Application	Programme Component
SE.5, OE.6, AB.5	Facilitation	Support system-level communication and resource sharing	Regular inter-agency meetings for VCSE, SPs, GPs to coordinate efforts	*Stakeholder Coordination Forum*
K.7, SE.8, OE.7, AB.7	Self-Monitoring (Self-Regulation Theory)	Encourage progress tracking and problem-solving	Use of outcome monitoring templates and reflective tools	*Progress Tracking Toolkit*
	Goal Setting (Goal-Setting Theory)	Support specific, measurable actions	SPs help users define and revisit achievable NBI goals	*User Planning & Goal-Setting Worksheet*

5.4.1 *Intervention Recommendations*

Drawing on the logic model of change, the behavioural theories discussed in Section 5.2.3, and priorities identified by stakeholders, six interconnected components are proposed as part of the intervention. Each is designed to address specific behavioural and environmental determinants by applying theory-based methods in practical and user-focused ways.

The first proposed component is a short promotional video, designed to raise awareness of SP and NBSPs. This video will include real-life accounts from individuals who have successfully engaged with NBSPs, as well as input from practitioners and VCSE providers. The intention is to normalise these approaches and reduce stigma by making them more visible and relatable. This component draws on the method of modelling (Bandura, 1997) by presenting role models from similar backgrounds to potential users, and on consciousness-raising strategies to increase understanding of what SP and NBSPs involve and the benefits they may bring. The video is intended for use in clinical waiting areas, on social media, and in community settings, offering broad and flexible reach.

A second component is a training video and accompanying resource package for implementers and adopters, including social prescribers, VCSE staff, and other frontline professionals involved in the referral and delivery of NBSPs. This element responds to environmental determinants such as inconsistent referral practices, low confidence among professionals, and lack of up-to-date service knowledge. The training video will present evidence-based content, case examples, and testimonials from both practitioners and service users to enhance professional self-efficacy and promote consistency. This applies the method of modelling (Bandura, 1997), by showing practitioners examples of effective referral and delivery in action, as well as environmental restructuring, by embedding practical tools and guidance directly into their working environment to make consistent practice easier. These resources operationalise methods such as environmental restructuring (embedding guidance into daily workflows), facilitation (providing prompts to support decision-making and coordination), and verbal persuasion (offering clear scripts to build practitioner confidence). By combining practical tools with theory-based techniques, the materials are designed to strengthen consistency and self-efficacy in referral and communication practices.

The third component is a Nature Needs Assessment Tool. This self-reflective resource will guide individuals through a simple self-assessment to consider their current needs, interests, and readiness to engage with local nature-based opportunities. It operationalises the method of facilitation (Michie et al., 2011), by helping users identify potential barriers, explore solutions, and plan realistic pathways into participation. In line with Self-Regulation Theory (Carver & Scheier, 1982), it encourages reflective monitoring and intention-setting, while principles from SDT (Ryan & Deci, 2000) support intrinsic motivation and autonomy by enabling individuals to make values-aligned choices. Together, these methods address determinants such as low self-efficacy and motivational uncertainty, supporting performance objectives related to planning, deciding to engage, and sustaining participation (PO1–PO4). The tool is expected to be developed in both paper and digital formats and will be co-designed with service users to ensure relevance and accessibility.

A fourth component is an Interactive Local Nature Map. This online map will provide clear and accessible information about nearby green spaces, activities, and NBSPs providers. By increasing familiarity with local options and reducing uncertainty, this component aims to address opportunity-related barriers and build confidence in participation. The strategy reflects principles of environmental restructuring by altering the informational environment and improving access to supportive settings. The map will include practical filters such as activity type, accessibility features, and times, alongside visual content and testimonials to help users imagine themselves taking part. It may also include links to referral options or direct booking features.

A fifth component is an Outcomes Monitoring Tool. This resource will enable users to track their progress and reflect on their experiences in a flexible and low-burden way. It may be offered in various formats, including digital check-ins, paper forms, or verbal prompts from facilitators, depending on user preference. The tool draws on goal-setting theory (Locke & Latham, 1990) by encouraging individuals to set specific, meaningful goals related to wellbeing and engagement. It also applies self-monitoring strategies by supporting users to observe changes in their behaviour or wellbeing over time. In addition to supporting individual reflection, the tool is intended to provide useful data for practitioners and programme providers in evaluating progress and outcomes.

Finally, a Stakeholder Community Forum is proposed to support improved system-level coordination. This forum will offer space for ongoing communication and collaboration among SP link workers, VCSE providers, and commissioners. It is intended to address environmental determinants such as inconsistent referral pathways and limited inter-agency dialogue. Behaviour change methods such as facilitation, restructuring of social support, and feedback mechanisms will be applied to help align expectations, share challenges, and strengthen professional networks.

Together, these six components (summarised in Table 11) form a multi-level, theory-informed strategy aimed at reducing key barriers to SP and NBSP engagement. Each is explicitly linked to identified determinants and performance objectives and has been shaped through stakeholder input. Their feasibility and acceptability will be explored further in Chapter 6 through qualitative data gathered from key stakeholders.

Table 13

Recommended Components of the Nature-Based SP Intervention

Component	Rationale / Evidence Base	Practical Application
Promotional video	Increases awareness and perceived legitimacy of NBSPs; addresses low knowledge and trust.	Short co-designed video introducing NBSPs and their benefits, used in GP surgeries, community hubs, and online platforms.
Nature needs self-assessment tool	Encourages self-reflection and autonomy; helps address barriers such as time, confidence, and guilt. Provides a preparatory step before engagement with a link worker.	Online, user-friendly questionnaire that individuals complete independently to identify personal needs, motivations, and barriers. Results can be shared with link workers if desired.
Interactive green space map	Overcomes transport and access barriers; increases familiarity and opportunity by highlighting local options.	Digital map showing local green spaces and activities, filterable by accessibility, transport, and type of activity.
Outcome tracking template	Reinforces behaviour change through self-monitoring and feedback; supports motivation and practitioner follow-up.	Simple online or paper-based tools to record participation, wellbeing outcomes, and activity levels over time.
Facilitator training & guidance	Builds trust and confidence, addresses staff uncertainty and training gaps.	Brief training and guidance for facilitators on supporting anxious or low-confidence participants and ensuring inclusivity.
Stakeholder forum	Improves collaboration, sustainability, and alignment across healthcare and community partners.	Regular forum bringing together link workers, practitioners, and community organisations to share learning and coordinate delivery.

5.5 Chapter Summary and Next Steps

This chapter presented the first three steps of the IM framework (Bartholomew Eldredge et al., 2016), moving systematically from needs assessment to the formulation of a theory-informed, evidence-based intervention designed to enhance engagement with SP and NBSPs. Rather than serving as a transitional or bridging chapter, it constitutes a key phase of the research by operationalising findings from earlier studies into structured strategies for change.

The chapter began with a synthesis of empirical findings from Study 1 and Study 2, which were used to construct a logic model of the problem. This process identified individual, environmental, and systemic barriers to engagement, including limited public awareness, low confidence in accessing services, under-resourced VCSE infrastructure, and fragmented referral systems (Fixsen et al., 2005; Dayson & Bashir, 2014; Husk et al., 2019). These findings informed the development of a logic model of change, which outlined specific performance objectives and behavioural determinants across individual and organisational levels.

A range of behavioural theories, including SCT (Bandura, 1997), the HBM (Glanz et al., 2015), and SDT (Ryan & Deci, 2000), were applied to ensure that the intervention was underpinned by a robust theoretical rationale. These frameworks informed the selection of change methods, such as modelling, consciousness-raising, goal-setting, and self-monitoring, that were used to design practical strategies addressing the identified barriers.

The intervention components developed through this process include tools aimed at enhancing service user autonomy and confidence, improving access to nature-based opportunities, strengthening outcome tracking, and fostering improved inter-agency coordination and professional confidence. Stakeholder input was integrated throughout to ensure contextual fit and acceptability, consistent with best practices in participatory intervention design (Bate & Robert, 2007; Greenhalgh et al., 2016).

Importantly, this chapter directly contributes to the thesis's overarching research questions. The needs assessment and theoretical mapping respond to Research Question 1 by identifying the psychological, social, and to some extent biological mechanisms through which SP and NBSPs may influence health behaviours. The intervention design process addresses Research Question 2 by differentiating how traditional social prescriptions and nature-based approaches are perceived and operationalised in practice. Additionally, the stakeholder-informed approach speaks to Research Question 3 by incorporating the distinct views of service users, social prescribers, and VCSE providers regarding barriers and opportunities for engagement. Crucially, this chapter also addresses the first part of Research Question 4 by demonstrating how a theoretically informed, co-designed intervention can be systematically developed from identified needs and barriers using the Intervention Mapping framework.

The next chapter (Chapter 6) presents a qualitative exploration of the proposed intervention components. Feedback from key stakeholders will be used to assess acceptability, perceived value, and feasibility. This stage is essential for refining the intervention and ensuring that it is both implementable and responsive to the contexts in which it will be delivered.

Chapter 6 Green prescribing intervention to increase engagement: A qualitative feasibility and acceptability study.

6.1 Chapter Overview

This chapter presents Study 3, which was developed in response to the findings of Studies 1 and 2. Study 1 examined the scope and effectiveness of SP interventions, particularly comparing nature-based and non-nature-based approaches. Study 2 explored individuals' perceptions of SP and nature, identifying barriers and facilitators to engagement.

Drawing on these insights, a theory-informed intervention was proposed in Chapter 5 using the IM (Bartholomew et al., 2016) framework. This intervention aimed to address key engagement factors such as access to resources and training, trust-building, expectations, experience, capacity, and perceived outcomes.

Study 3 corresponds to Step 4 of the IM framework, Programme Production, and constitutes the active co-design stage of this research. Having used stakeholder evidence from Study 2 to develop concept-level intervention components through the IM process (Chapter 5), this study returned those concepts to stakeholders, including service users, implementers, and adopters, for direct critique and refinement. Components were kept deliberately unfinished at this stage to enable genuine co-design input rather than post-hoc endorsement (Slattery et al., 2020; O’Cathain et al., 2019). The resulting stakeholder feedback was used to identify specific refinements to each component’s content, format, framing, and delivery mechanism, summarised in Table 13. This chapter therefore reports both the feasibility and acceptability findings and the co-design outcomes, the specific ways in which stakeholder engagement shaped the intervention prior to piloting.

The recommendations developed through the IM process, and which are the focus of feasibility and acceptability testing in this study, include:

- A video aimed at promoting nature engagement.
- A nature needs assessment to help in deciding the best option for an individual and what to do next, reducing the impact on SP.
- An interactive nature map to improve local knowledge of green spaces and nature-based opportunities.
- A provider-facing training video, paired with MI resources, designed to strengthen practitioner confidence and communication in promoting nature-based interventions.
- A tool for measuring outcomes to monitor and report on the effectiveness of the interventions to ensure positive impact for both the individual and the services.
- A stakeholder community forum to foster collaboration and knowledge-sharing.

Assessing acceptability ensures that interventions resonate with users, are perceived as relevant, and align with their preferences and needs (Sekhon et al., 2017). Similarly, assessing feasibility involves evaluating whether the interventions can be implemented effectively within the constraints of time, resources, and context (Glasgow et al., 2019). This is particularly important for NBSPs, where diverse social, environmental, and logistical factors influence how people access and connect with nature (Barton & Pretty, 2010).

As discussed in Chapter 3, the IM approach provides a comprehensive framework for developing health-related interventions. While implementation and evaluation are addressed in later steps (Steps 5 and 6), Step 4 is crucial for refining theoretically informed concepts based on stakeholder input, prior to full-scale implementation (Bartholomew et al., 2016).

While Research Question 3, Do different stakeholder groups perceive different opportunities and barriers to using social prescriptions, specifically NBIs? was initially addressed through the qualitative needs assessment in Chapter 4, this chapter extends that inquiry by exploring how different stakeholder groups perceive the feasibility and acceptability of intervention components specifically designed in response to their earlier feedback. In doing so, it provides additional insight into whether the practical and emotional barriers previously identified are meaningfully addressed by the proposed solutions, and whether these responses vary according to stakeholder role. This chapter also contributes to Research Question 4 by testing the co-designed intervention in practice, forming the second part of the answer to how a theoretically informed intervention for nature-based social prescribing can be developed, tested, and evaluated within SP pathways.

Rather than testing fully developed resources, this study explores the perceived feasibility and acceptability of concept-level recommendations shaped by the stakeholder needs identified in Studies 1 and 2. The objectives of this study are to:

- Assess the perceived relevance, usefulness, and engagement of the recommended interventions.
- Identify practical barriers or challenges to their implementation in real-world settings.
- Gather insights from stakeholders on how the recommendations can be adapted or supported for effective implementation and sustainability.
- Identify practical steps, resources, and support needed to successfully roll out the recommended interventions.

6.2 Method

The qualitative methods in this study aimed to collect data relating to the proposed interventions, from those who can provide, promote, deliver, and potentially participate in them. Focus groups were used to assess and develop their feasibility and acceptability in helping to increase the uptake of NBSPs. Separate groups were conducted with stakeholders involved in delivery (Implementers and adopters), and with members of the public or potential service users.

It is important to be explicit about what co-design meant within this study and which prior data and procedures contributed to it. In this thesis, co-design refers to a structured, iterative process in which stakeholder perspectives, gathered empirically across Studies 1 and 2, directly shaped the content, format, and priorities of each intervention component, with Study 3 providing the stage at which stakeholders actively refined those components rather than simply endorsing them (Slattery et al., 2020). The co-design process unfolded across three stages. First, the qualitative needs assessment in Study 2 (Chapter 4) generated the evidence base from which intervention needs were identified: service users' accounts of needing professional 'permission' to prioritise self-care (Theme 4.4.3.3) informed the NHS-branded framing of the Nature Needs Assessment; their descriptions of deterrence through unfamiliarity with settings (Theme 4.4.3.1) shaped the rationale for the Interactive Nature Map; adopters' reports of feeling underprepared for participants with complex needs (Theme 4.4.2) directly informed the provider-facing training component; and the mismatch between referrer and provider expectations (Theme 4.4.5) underpinned the Stakeholder Community Forum. Second, these findings were translated into concept-level intervention components through the IM process (Steps 1–3, Chapter 5), with components deliberately kept unfinished to enable further stakeholder input. Third, the current study (Study 3) returned these components to a diverse stakeholder group through focus groups and individual interviews, inviting direct critique and adaptation. The feedback gathered, analysed using reflexive thematic analysis, produced the specific refinements described in each Results subsection and summarised in Table 13, completing the co-design cycle.

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6.2.1 *Participants and recruitment*

In this study, implementers were identified as social prescribers, whose role within GP surgeries is to connect patients with community resources. Adopters were defined as individuals responsible for planning and delivering interventions within the community.

One focus group was conducted with four members of the general public, and a second focus group was held with three stakeholder participants (one implementer and two adopters). Due to scheduling difficulties, two stakeholder participants (one implementer and one adopter) were interviewed individually instead of joining the focus group. In total, four members of the general public, two implementers, and three adopters participated in the study. Participants were recruited using purposive and convenience sampling. This included individuals who had taken part in Study 2 and had consented to be recontacted, as well as others who responded to a recruitment email (Appendix A) distributed through community and healthcare networks.

The eligibility criteria for the participants were as follows: Participants should be over the age of 18, live in England and speak fluent English, for the stakeholder focus group participants also needed to either work as a social prescriber or deliver a socially prescribed activity in England. Those who met the criteria were then invited to take part in a focus group on Microsoft Teams. It is important to note that the majority of participants across all groups were White British and most were women. While this reflects patterns observed in earlier phases of this research and in broader SP engagement, it does limit the transferability of findings. This pattern is consistent with existing evidence suggesting that engagement with SP interventions often underrepresents certain groups, including minoritised populations and those facing greater barriers to access (e.g., Bickerdike et al., 2017; Drinkwater et al., 2019). The participant information can be found in Table 12 below.

Table 14

Participant Characteristics – Study 3

Group	Sample Size (n)	Setting	Age Range	Ethnicity (n)	Gender (n)
Users	4		38-63	White British	4 Female
Implementers	2	NHS Primary Care	45-54	White British	2 Female
Adopters	3	VCSE	31-56	White British	2 Female, 1 Male

6.2.2 *Materials*

Participants were presented with a brief overview of the six proposed intervention components, which were still in conceptual form. These were not fully developed tools, but rather structured ideas grounded in findings from Study 2 and designed using IM Step 3. The aim was to assess the feasibility and acceptability of the proposed interventions prior to further development. Participants were then asked questions from a topic guide, created specifically for this study, which included key questions regarding each proposed intervention (see Appendix H).

The topic guide was developed collaboratively by the lead researcher (doctoral researcher) in consultation with the supervisory team. It was informed by the study's overall objectives and the principles of IM Step 4, with a focus on capturing stakeholder perspectives on relevance, practicality, and potential barriers to implementation.

Questions addressed aspects such as perceived usefulness, potential challenges in delivery, and suggestions for adaptation. For example, participants were asked, "How useful do you think this intervention would be in practice?" to explore perceived relevance, and "What, if anything, would make this intervention easier to implement or access?" to identify feasibility-related barriers and enablers.

6.2.3 *Procedure*

Individuals were given an information sheet to ensure they were aware of the study they would be taking part in (see Appendix H), following this they were given a consent form (see Appendix I) to sign and date to confirm they were happy to take part and that they could withdraw from the study at any time, including removing their data after the study was complete. The information sheet and consent form had been pre-approved by the University of Sunderland Research Ethics Group (see Ethics section). Participants were interviewed by Tina Robson, PhD student, who attended training in conducting and analysing qualitative interviews and data provided by the University of Sunderland.

Focus groups were carried out in March 2025 and ranged between 30 and 75 minutes and focus group participants were asked to ensure they had a quiet space and good internet connection. Participants were informed that the focus group could take up to one-hour and would be recorded. Interviews, ranging between 30 and 40 minutes, were conducted and recorded, and participants were given the opportunity to ask any questions. Following this, the focus groups and interviews recordings were transcribed using Microsoft Teams and checked for accuracy. All information was held according to ethics and data protection.

6.2.4 *Ethics*

Ethical approval was obtained from the University of Sunderland Research Ethics Group (see Appendix J) and the BPS Code of Human Research Ethics (2021) was fully considered and adhered to. Participants were briefed and informed of content before they agreed to take part and were also provided with details of my supervisor on the information sheet, should they have felt they needed to seek any further support upon completion of the study. Consent was given by individuals based on the information sheet they had been provided, as well as the opportunity they had to ask questions before the study commenced.

Another ethical consideration was the storage and management of data. Each participant was assigned a unique identification code to ensure anonymity and to enable their data to be identified and withdrawn if requested. All data were anonymised during transcription so that individuals could not be identified from the information they provided. Participants were informed that the focus groups and interviews would be audio-recorded for transcription purposes. Data were stored securely in locked cabinets or on a password-protected computer, accessible only to the research team, and will not be retained for longer than necessary, in accordance with university ethics policy.

6.3 Data analysis

This study used rTA, as outlined in section 4.3, to explore participant perceptions of the proposed intervention components. Initial coding and theme development followed Braun and Clarke’s (2006) guidance, with codes developed inductively from the data. Thematic patterns were then reviewed and refined to capture key issues relating to feasibility, acceptability, and practical implementation. An overview of the coding framework for Study 3 is provided in Table A4 (See Appendix), while illustrative participant quotes aligned with the final themes are presented in Table A5 (See Appendix).

While the initial analytic framework grouped themes across the dataset (e.g., perceived value, barriers, sustainability), the final presentation of findings has been structured by intervention component. This decision was made to better reflect the applied nature of the study and to support clearer insights into how each proposed tool, such as the promotional video, nature needs assessment, and interactive map, was individually received by participants.

This approach maintains the analytic integrity of rTA by presenting evidence-based themes within each intervention domain. It also supports the study's aim of informing the refinement and development of each component, ensuring that stakeholder feedback is presented in a way that directly supports practical application and informs the next stage of the Intervention Mapping process, including refinement and preparation for pilot testing. This structure mirrors the six intervention components introduced in Chapter 5 and allows each to be evaluated on its own merit. Presenting the themes by component also facilitates targeted refinement and ensures alignment with stakeholder needs identified earlier in the IM process.

6.3.1 *Reflexivity*

This phase of the research marked a shift from earlier exploratory work to applied intervention design. Unlike previous studies focused on understanding lived experience and structural barriers, this stage positioned me as both a researcher and intervention developer, responsible for translating findings into concrete proposals.

This dual role required a heightened awareness of reflexivity, particularly in how intervention concepts were introduced and discussed. To support open and honest dialogue, I clearly framed all materials as provisional and invited critique from participants. This approach encouraged balanced responses, with stakeholders engaging both critically and constructively. I also maintained a reflective journal throughout the process, which helped me identify moments where I felt overly invested in particular components or was tempted to justify design decisions during facilitation. Engaging reflexively in this way allowed me to recognise and bracket my own assumptions, reducing the risk that personal perspectives or expectations influenced participants' input or the interpretation of findings. These practices helped mitigate bias and ensured that stakeholder perspectives, not researcher assumptions, guided the interpretation and refinement of proposed interventions.

6.4 Results

This section presents findings from the focus groups and interviews that explored the perceived feasibility and acceptability of the proposed intervention components. Thematic analysis was used to identify patterns in participants' responses, following Braun and Clarke's (2006) framework and the process described in Section 6.3.

While the initial themes spanned across the dataset, capturing overarching issues such as perceived value, motivation, sustainability, and practical barriers, the findings are presented here by intervention component. This structure was chosen to better align with the applied aims of the study and to directly inform the refinement of each proposed tool. It enables a focused exploration of how each resource was received by different stakeholder groups. The intervention components discussed include: a promotional video, a nature needs assessment tool, an interactive nature map, a provider-facing training video with MI resources, an outcome measurement tool, and a stakeholder community forum.

The following subsections present the feasibility and acceptability findings for each of the six proposed intervention components developed in Chapter 5. Within each section, sub-themes highlight participants' views on emotional and practical relevance, perceived usefulness, accessibility, and implementation challenges. Illustrative quotations from service users, implementers, and adopters are included throughout to demonstrate how each concept was received and experienced in context.

6.4.1 *Promotional Video*

The proposed promotional video, designed to encourage engagement with NBIs, was generally well received by participants. It was viewed as a potentially effective tool for inspiring action, fostering hope, and supporting those who may feel uncertain or overwhelmed.

6.4.1.1 Perceived Relevance and Emotional Value. Service users emphasised the emotional and motivational potential of the video. Rather than simply delivering information, participants felt that the video could shift their mindset and offer a meaningful prompt toward positive change:

> Something like what you're suggesting... it gives you a little bit of a light at the end of the tunnel because you're thinking to yourself, I'm going to do this, I'm going to get out into nature, I'm going, I'm going to sort my head out. Do you know what I mean? (Service user, U01)

Practitioners also recognised the practical value of the video, noting that having accessible and consistent resources could help streamline their conversations with clients, one said, “Our job is made so much easier if we've got all those services and opportunities available.” (Implementer, I02)

6.4.1.2 Engagement and Presentation Considerations. Participants were clear that the success of the video would depend heavily on its format and presentation. Brevity was repeatedly highlighted as essential: “I would just say it would need to be a short video not too long, or I think a lot of people would just zone out of it.” (Service user, U02)

Equally important was local relevance. Viewers needed to see places and examples that reflected their own environment. Otherwise, the video risked feeling distant or irrelevant, one said, “If it randomly showed... the beach or whatever, I think oh, that doesn't really apply to me because I'm not going to drive an hour to do, you know what I mean?” (Service user, U04)

These points highlight how visual storytelling can resonate most effectively when it is brief, emotionally grounded, and contextually specific.

6.4.1.3 Feasibility and Sustainability. While the concept of the video was welcomed, participants raised important concerns about its longer-term sustainability. Several questioned how such a resource would be maintained, especially in terms of updating content and resolving potential technical issues, one participant shared, “So, the worry is that you put things into a video which will then come to an end because that's the nature of the... that’s, to me the biggest problem with most of these.” (Adopter, A03). While another queried, “Who’s going to keep the information up to date and be responsible for making sure there’s no tech issues?” (Implementer, I01)

These concerns reflect broader issues around digital resource maintenance, particularly where ownership is unclear and funding is limited. Without a defined plan for updating and supporting the video, its relevance and effectiveness may diminish over time.

6.4.1.4 Implementation Considerations. Some stakeholders suggested potential strategies for embedding the video into existing systems to improve visibility and reduce barriers to access. For example, one implementer proposed utilising digital screens in GP waiting areas: “All of the screens are now reappearing in the surgeries and there seems to be a push to use the information screens.” (Implementer, I02)

Although this suggestion may increase exposure and awareness, it does not resolve deeper structural questions around who manages and funds such resources in the long term. Participants generally agreed that any promotional video must be supported by clear governance, resourcing, and relevance to local contexts to remain effective over time.

6.4.2 *Nature Needs Assessment*

The proposed nature needs assessment tool was introduced as a way to guide individuals through identifying what kind of NBIs might suit them best, while also helping practitioners make more tailored referrals. Participants broadly welcomed this idea, noting its potential to provide clarity, structure, and personalisation for those considering nature-based options. However, key concerns were raised about how the tool would be delivered, who would support its use, and how accessible it would be, especially for individuals in vulnerable states or with limited confidence.

6.4.2.1 Perceived Value and Purpose. Participants valued the concept of a needs assessment that could act as a bridge between a general recommendation and a personalised course of action. Service users, in particular, described how helpful it would be to receive guidance that felt tailored to their current needs and circumstances, rather than being left to navigate choices independently:

> If it is like a questionnaire and it is associated with the NHS, then people would say well actually the NHS is telling me that I should try and... even if it is, you know, going to your garden for 20 minutes a day... then people might be more inclined to do it because you would feel like it's personalised then. (Service user, U04)

This sense of personalisation was not only practical but also offered a kind of emotional validation, reinforcing that small steps were legitimate and valuable.

Practitioners similarly saw value in a structured tool that could help guide conversations and identify appropriate activities without relying solely on professional judgment in short consultations. One implementer noted: “Sometimes you’re trying to guess what might land with them, but if they had something they’d filled in beforehand, it would help make that discussion a lot more useful.” (Implementer, I01).

6.4.2.2 Support Needs and Accessibility. Despite its appeal, participants stressed that the success of a needs assessment would depend heavily on how it was introduced and supported. Multiple participants, across stakeholder types, emphasised that vulnerable individuals may find it hard to complete a tool like this independently, especially if they are overwhelmed, anxious, or lacking in confidence. As one service user described, "When you're in that state, you don't want to be overwhelmed with stuff because it's really frigging hard to make a decision." (Service user, U02)

This concern highlights the risk that a self-guided tool could inadvertently reinforce disengagement unless it was paired with some form of supportive dialogue, either from a practitioner or another trusted intermediary. Participants also suggested that if the tool were delivered digitally, issues of digital exclusion would need to be addressed explicitly.

6.4.2.3 Trust and Framing. Participants consistently pointed to the importance of trust and perceived authority in shaping whether individuals would engage with the assessment. Specifically, they noted that an NHS-branded or health-professional-recommended tool would carry more weight and legitimacy than one provided by a less familiar source: "It being from the NHS would make a big difference, it just makes people take it more seriously, especially if they're unsure about doing it." (Service user, U03)

This highlights the relational dynamics underpinning tool engagement. Rather than being a standalone resource, the assessment was seen as something that should be embedded in a broader support process, framed by a trusted professional and accompanied by clear, compassionate guidance.

6.4.2.4 Implementation Considerations. To address these challenges, several participants suggested options such as:

- Delivering the assessment in-session with a practitioner or link worker

- Providing a printed version for those uncomfortable with digital formats
- Ensuring the tool was brief, easy to understand, and emotionally sensitive in tone.

Some also suggested that the tool could include a short preamble to explain its purpose, helping people understand that even small or localised nature interactions (like sitting in a garden) "count" and are worth pursuing.

6.4.3 *Interactive Nature Map*

The proposed interactive map was designed to help individuals identify local green spaces and NBIs, with the aim of improving awareness, accessibility, and engagement. Participants generally viewed this component positively, particularly for its potential to demystify “what’s out there” and make nature feel more reachable. However, concerns were raised around digital access, information accuracy, and the need for contextual detail to ensure the tool was genuinely useful to diverse users.

6.4.3.1 Perceived Usefulness and Practical Value. Participants highlighted a common problem: people often do not know what local nature-based resources exist, or they underestimate what counts as "nature" in their own communities. In this context, the interactive map was welcomed as a tool to surface hidden opportunities and provide a simple way to explore nearby options. As one adopter explained, “People don’t always realise what’s on their doorstep, especially if they’re not used to looking for it. Something visual like a map could really help with that.” (Adopter, A03)

Service users echoed this, with some noting that they would feel more confident trying something new if they had a sense of what to expect in advance. One said, “I think if I saw it on a map, and I knew it was near me and it said what was there, I’d be more likely to try it.” (Service user, U02)

6.4.3.2 Importance of Detail and Context. However, participants stressed that the map would need to provide more than just location pins or generic labels. They wanted clear, contextualised information, such as whether a green space was accessible by public transport, whether it had benches, or whether it was suitable for people with limited mobility. One implementer noted, "It's not just about where something is, it's about what it's like when you get there. Is it safe? Is it clean? Is it open to everyone?" (Implementer, I01)

There was also interest in including filters or categories to help users narrow down options based on their needs, such as low-cost, family-friendly, wheelchair-accessible, or beginner-friendly activities. This aligns with wider stakeholder calls for nature interventions to be inclusive, transparent, and responsive to individual circumstances.

6.4.3.3 Barriers: Digital Exclusion and Maintenance. While the map's potential was widely acknowledged, several participants raised concerns about digital accessibility and the risk of digital poverty excluding certain groups. Not all users, particularly older adults or those on low incomes, may be comfortable with online tools or mobile apps. As one implementer explained, "There's a lot of people who either don't have a smartphone or wouldn't know how to use something like that. It needs to work offline or have a paper version too." (Implementer, I02)

Another concern was sustainability, specifically, how the map would be maintained and kept up to date. Participants expressed scepticism about the longevity of digital tools in the absence of dedicated funding or management, "Maps are great at first but then what happens when the information changes? Who's responsible for updating it?" (Adopter, A03)

This echoes similar concerns raised about the video resource and reflects broader challenges in digital intervention design, particularly within community and voluntary sectors that may lack capacity for ongoing tech maintenance.

6.4.3.4 Implementation Suggestions. To mitigate these challenges, participants recommended:

- Partnering with local authorities or community groups already maintaining directories of green spaces
- Embedding the map in existing websites or platforms (e.g., local NHS or council websites)
- Offering downloadable or printable versions for those without digital access
- Including user reviews or community input to keep content dynamic and relevant.

Overall, the map was seen as a promising resource, if it was localised, well-maintained, and easy to navigate. It had particular appeal as a way to empower users to explore their environment with greater confidence and autonomy, provided that issues of access and upkeep were thoughtfully addressed.

6.4.4 *Outcome Measurement Tool*

The proposed outcome measurement tool was introduced as a way to monitor and report the impact of nature-based interventions, both for individual progress and to support broader service evaluation. While participants recognised the value of evidencing outcomes, particularly for funding and accountability purposes, there were divergent views across stakeholder groups on how such a tool would be implemented in practice. Concerns focused on time pressures, potential duplication, and the risk of measurement becoming a bureaucratic burden. Service users were generally open to the idea of tracking their own progress, valuing the potential for personal reflection, though only if the process felt simple and meaningful rather than clinical. Implementers and adopters, by contrast, were primarily concerned about the administrative implications: both groups described existing reporting pressures as already unsustainable and viewed an additional measurement tool with considerable scepticism unless it could be integrated into current workflows without adding burden. This divergence, between potential service users' appetite for self-reflection and practitioners' concerns about capacity, reflects a broader tension in SP evaluation between person-centred approaches and system-level accountability demands.

6.4.4.1 Perceived Value and Purpose. Participants acknowledged the importance of measuring the impact of interventions, especially in light of growing pressures for services to demonstrate effectiveness. For practitioners, the tool was seen as a potential way to gather structured feedback and track progress over time. One adopter noted, "We do need something to show what's working, especially when we're applying for funding or trying to keep projects going." (Adopter, A02)

Implementers also saw potential benefit in having a consistent and structured way of capturing outcomes, "It would be good if we had something that showed what difference it made, because sometimes we just don't know unless people tell us." (Implementer, I01)

Service users, meanwhile, saw some appeal in being able to reflect on their own progress, but only if the process felt manageable and meaningful. As one participant put it: "It might help people see how far they've come, but only if it's simple... not another form you feel like you have to fill in." (Service user, U02)

6.4.4.2 Concerns about Burden and Practicality. Despite recognising the rationale for outcome measurement, there were strong concerns across stakeholder groups about the practical implications of implementing such a tool. Time constraints, particularly among implementers and those in primary care, were frequently mentioned, “We’re already overloaded with paperwork. Unless it’s built into what we already do, people just won’t use it.” (Implementer, I02)

This was echoed by adopters, who described how small community organisations often lack administrative support and are wary of tools that require standardisation or reporting beyond their capacity, “We get asked to report on outcomes all the time, but there’s rarely any support with how to do it or time to do it properly.” (Adopter, A01)

These reflections suggest that while outcome measurement is widely seen as important, it also risks creating barriers to participation or sustainability if it is overly complex or detached from existing workflows.

6.4.4.3 Implementation Considerations. To ensure feasibility, participants proposed a number of pragmatic adjustments, including:

- Keeping the tool brief and easy to administer (e.g., a few key questions)
- Integrating it into existing systems, such as electronic health records or post-activity check-ins
- Allowing service users to complete it at their own pace or at home
- Ensuring it is used collaboratively, not just as a formality.

Some also stressed the need for the tool to capture meaningful, person-centred outcomes, rather than relying solely on clinical or generic indicators. This included emotional benefits, confidence, routine, or sense of purpose, outcomes that are often harder to quantify but highly valued by participants. One said, “It’s not always about depression scores or anxiety scales. Sometimes it's about whether someone feels like they've got something to get up for." (Adopter, A02)

Overall, while the outcome measurement tool was accepted in principle, participants were clear that it would need to be light-touch, flexible, and context-sensitive to avoid undermining its purpose. A co-designed approach, developed with frontline staff and service users, was seen as the best way to ensure relevance and usability.

6.4.5 *Stakeholder Community Forum*

A stakeholder community forum was proposed as a space for knowledge-sharing, collaboration, and mutual support among those involved in delivering, promoting, or participating in nature-based interventions. Participants were generally supportive of this idea, seeing it as a way to strengthen relationships across sectors, reduce duplication, and improve access to opportunities. However, they also highlighted potential barriers related to time, platform fatigue, and clarity of purpose, especially within overstretched service environments.

6.4.5.1 Perceived Value and Collaborative Potential. Participants expressed enthusiasm about the idea of a forum that could bring together implementers, adopters, and community members. For many, the forum was seen as a way to break down silos between services and improve coordination around SP pathways, "It would be helpful just to know what everyone else is doing. So often we're working in isolation and not even aware of stuff that's already going on." (Adopter, A01)

The forum was also viewed as a way to share good practice, pool resources, and strengthen connections between primary care and the voluntary/community sector, "If there's a way we can all contribute and learn from each other, it might stop people reinventing the wheel all the time." (Implementer, I01)

This collaborative potential was especially appealing given the complexity of SP systems and the variety of stakeholders involved.

6.4.5.2 Challenges: Time, Capacity, and Engagement. Despite the support for the concept, participants raised concerns about practical engagement, notably the time and energy required to attend or contribute to another platform or meeting space. Many stakeholders were already involved in multiple forums, meetings, and digital channels, leading to what several described as "forum fatigue" or information overload, "There's a lot of these kinds of networks already, and the challenge is actually getting people to come or contribute regularly." (Adopter, A02)

Practitioners similarly noted that unless the forum had a clear purpose and added value, it risked being overlooked in favour of more immediate operational priorities, "I think people would need to see the point of it really quickly or they just won't have the time." (Implementer, I02)

Concerns were also raised about who would host or maintain the forum, and how it would be moderated to ensure usefulness and inclusivity.

6.4.5.3 Suggestions for Implementation. To increase the likelihood of success, participants suggested integrating the forum into existing infrastructure or routines rather than building something entirely new. This included:

- Hosting the forum within established digital platforms already used by primary care or voluntary organisations (e.g., NHS Teams channels, local authority intranets)
- Embedding forum updates or contributions into regular MDT meetings or newsletters
- Creating time-limited working groups focused on specific issues rather than expecting broad, open-ended participation.

Service users also expressed interest in having some voice in the forum, provided it felt safe and meaningful, rather than tokenistic. There was some appetite for a space where feedback could be shared or where users could recommend or NBIs, “I think it would be good if people could say what’s worked for them. Like a way to hear from others in similar situations.” (Service user, U04). This points to the importance of inclusive design, where the forum supports not only professional collaboration but also amplifies user experience and insight in a respectful and structured way.

It is worth noting, however, that these two perspectives, practitioner caution about feasibility and service user interest in inclusion, are not simply complementary but in some tension. Practitioners questioned whether they had the time and energy to sustain participation in yet another platform, while service users expressed a desire for meaningful involvement that would require dedicated structure and facilitation to achieve. Any implementation of the forum would therefore need to resolve this tension explicitly, building in mechanisms that enable user voice without placing additional demands on already stretched delivery staff.

6.4.6 *Provider-Facing NBSP Training Video and Motivational Interviewing Resources*

This intervention component was proposed to support practitioners, particularly social prescribers and community link workers, with a brief training video and accompanying resources focused on MI techniques and best practices for promoting NBSPs. Participants responded positively to this idea, especially in light of common challenges around time, confidence, and sustaining engagement with patients. However, they emphasised that for such a resource to be effective, it would need to be practical, accessible, and relevant to real-world service pressures.

6.4.6.1 Perceived Value for Practice. Implementers and adopters recognised the benefit of a concise, targeted resource that could enhance their ability to introduce NBSPs confidently and meaningfully. Several participants noted that conversations around nature-based activity often rely heavily on personal confidence and relational skill, resources that not all practitioners feel they have. “I think something like that would help, especially for newer link workers or people who don’t feel confident talking about nature, it’s not always something we’re trained in.” (Implementer, I01). Another explained, “It would help us all be a bit more consistent too, so people aren’t just winging it based on their own interests or knowledge.” (Adopter, A01)

The inclusion of MI guidance was viewed as especially helpful for building conversations around change, particularly with individuals who may be hesitant, ambivalent, or struggling with motivation.

> We’ve had training in motivational interviewing, which is really useful—but it’s quite general. It would be helpful to have something more specific, like examples or prompts that relate to nature-based activities, especially for people who aren’t sure it’s for them (Adopter, A02)

6.4.6.2 Feasibility and Format Considerations. Time was again a major factor. Participants strongly preferred short, focused training videos that could be accessed on demand and easily integrated into busy schedules: “It’s got to be short, like, under ten minutes, otherwise people just won’t have the time to watch it.” (Implementer, I02)

There was also an appetite for modular content, allowing practitioners to dip in and out of specific topics (e.g., “How to introduce the idea of nature to someone with anxiety”), rather than sitting through long sessions. This was consistent with feedback on the promotional video and digital tools more broadly, brevity, clarity, and flexibility were recurring priorities.

6.4.6.3 Implementation Challenges and Suggestions. Participants were pragmatic about barriers to uptake, noting that even useful tools can get overlooked unless they are actively embedded into existing systems and routines. One implementer described how static training resources are often "sent round in an email and never looked at again," while another stressed the need for endorsement from trusted sources, such as NHS or local authority partners: "People are more likely to take it seriously if it's part of onboarding or if it's got the NHS logo on it, it's about trust and time." (Implementer, I01)

To address this, participants suggested:

- Embedding the video into induction training or CPD frameworks
- Including it in primary care network (PCN) staff updates or internal training libraries
- Offering a printable companion guide or PDF with MI tips and conversation starters
- Including examples of real-life conversations or practitioner testimonials.

There was also interest in having a short MI checklist or reference sheet that could be kept at a desk or on a tablet to support conversations during appointments.

6.4.6.4 Alignment with Broader Needs. This resource was seen as directly addressing one of the most persistent challenges highlighted throughout the study: the gap between referral and uptake. Several participants noted that the "handholding" needed to support people into NBIs could be made more manageable if practitioners were equipped with communication strategies that helped people build internal motivation, one participant said, "Sometimes it's just about knowing how to phrase things in a way that connects. We don't always get time to think about that." (Implementer, I02)

By offering practical tools that promote relational and motivational skills, this intervention component was seen as a key support for both individuals and systems, particularly when trying to scale up NBSPs engagement in time-limited or resource-constrained settings.

6.5 Discussion

This study examined the feasibility and acceptability of six co-designed NBSP intervention components. The findings indicate that the proposed ideas were generally well received, with participants describing them as relevant, supportive, and timely. Both service users and practitioners viewed the concepts as valuable additions to existing approaches, emphasising their emotional resonance and potential to motivate change. These findings align with research showing that co-produced and contextually grounded interventions enhance ownership and uptake (Fixsen et al., 2005; O'Cathain et al., 2019). Yet enthusiasm at the design stage does not always guarantee successful delivery; previous evaluations highlight that resource pressures and fragmented commissioning often constrain implementation (Bertotti et al., 2018; Tierney et al., 2020).

Although this research focuses on service users' capacity to engage with NBIs, the findings show that engagement is shaped by wider systems of delivery and support. Access and sustained participation depend on how implementers introduce opportunities and how adopters' resource and maintain them. This reflects implementation frameworks emphasising the interdependence of individual, organisational, and policy-level processes (Damschroder et al., 2009; Nilsen, 2015). Including implementers and adopters therefore enabled a more comprehensive understanding of the shared and role-specific factors influencing engagement, an approach increasingly recognised as essential within SP research (Wildman et al., 2019).

Importantly, the multi-stakeholder design also surfaced instances where group perspectives were not merely different in focus but genuinely conflicting. For the outcome measurement tool, service users expressed cautious openness to personal reflection, whereas implementers and adopters viewed additional measurement primarily as a burden on already-stretched capacity, a divergence that reflects the wider tension between person-centred SP values and funder-driven accountability demands (Bickerdike et al., 2017). Similarly, for the stakeholder community forum, service users sought meaningful inclusion and peer voice, while practitioners questioned whether they had capacity to sustain another collaborative platform. These conflicts are not resolvable through design refinement alone; they point to systemic tensions within SP delivery that any implementation strategy must address directly (Pescheny et al., 2019).

Participants appreciated the structured and personalised nature of the proposed recommendations. The promotional video was praised for its hopeful tone and motivational quality, particularly for those experiencing low mood. Service users valued its relatability, implementers saw it as a consultation aid, and adopters questioned how such a resource would be sustained. Similar tensions are reported elsewhere, where authentic and emotionally engaging materials risk becoming unsustainable without clear ownership (Chatterjee et al., 2018).

The nature-needs assessment was also welcomed for its potential to personalise support and guide next steps. Users valued reassurance from trusted branding such as the NHS, while practitioners focused on how it could streamline conversations. Adopters stressed accessibility for individuals facing digital exclusion. These findings echo evidence that credibility and usability underpin engagement (Husk et al., 2019; Moffatt et al., 2017) but also reflect concerns that digital tools may widen inequalities if literacy and infrastructure barriers are ignored (Wilson & Mabhala, 2022).

The interactive map was valued for increasing awareness of local green opportunities and making nature feel more accessible, consistent with evidence that perceived proximity influences participation (Barton & Pretty, 2010; Richardson et al., 2021). However, unequal access to safe or high-quality spaces can moderate these benefits (de Bell et al., 2020; Shanahan et al., 2016), and long-term maintenance remains a common challenge (Nilsen, 2015).

Participants regarded the outcome-measurement tool as important for demonstrating impact and sustaining funding. Practitioners valued structured feedback, adopters emphasised evidence for commissioners, and users supported simple, reflective measures. Calls for proportionate, co-designed evaluation processes support these preferences (Tierney et al., 2020), though others warn that overly brief tools may overlook complex, person-centred outcomes (Chatterjee et al., 2018).

The stakeholder community forum was seen as a practical way to improve communication and share learning. Yet feasibility concerns, time, engagement, and competing priorities, were prominent. Such challenges mirror wider evidence that cross-sector collaboration is crucial but difficult to sustain without clear governance and facilitation (Bagnall et al., 2021).

Finally, the provider-facing training video and MI resources were well received for their potential to build practitioner confidence and consistency. Implementers valued modular, time-efficient learning, while adopters saw a bridge between systems and frontline practice. Practitioner relational competence remains a key determinant of SP uptake (Husk et al., 2019; Wildman et al., 2019), though sustaining this relational intensity can increase emotional labour (Drinkwater et al., 2019).

Taken together, these findings suggest that the intervention components are both acceptable and feasible, though each requires targeted refinement to optimise implementation. Perceptions of value varied by stakeholder role: users prioritised trust and emotional tone, implementers sought efficiency and clarity, and adopters focused on sustainability and system integration. Designing for engagement therefore demands attention to the relational, structural, and systemic contexts in which behaviour occurs, consistent with ecological models of health behaviour (Bronfenbrenner, 1979; Sallis et al., 2015).

This study illustrates the importance of engaging stakeholders early and using a structured framework such as Intervention Mapping to guide development. Theory-driven, participatory methods enhance both intervention fit and implementation potential (Bartholomew Eldredge et al., 2016; O'Cathain et al., 2019). Nonetheless, enduring challenges, including insecure funding and fragmented commissioning, continue to limit the scalability of SP initiatives (Bickerdike et al., 2017; Pescheny et al., 2019). The feedback gathered here therefore offers practical refinements while acknowledging the systemic barriers that shape real-world delivery.

A summary of these refinements, linked to each intervention component, is presented in Table 13. These include NHS branding, brief modular formats, printable alternatives, and co-designed outcome tools. By articulating how each idea can be adapted to real-world constraints, this study contributes both to intervention development and to a broader understanding of how nature-based SP can be embedded meaningfully and sustainably within healthcare and community systems.

Table 15

Summary of Proposed Intervention Refinements

Intervention Component	Stakeholder Reception	Proposed Refinements
Promotional Video	Positively received for emotional impact and motivation; seen as a useful engagement tool	Keep brief, locally relevant, and emotionally authentic; embed within existing systems; assign ownership for long-term maintenance.
Nature Needs Assessment	Valued for helping personalise support and guide conversations	Deliver with practitioner support; include NHS branding to enhance trust; ensure accessibility for digitally excluded or vulnerable users.
Interactive Nature Map	Welcomed as a tool to enhance local awareness and confidence	Provide contextual detail and filtering options; offer both digital and printable formats; partner with local groups to support updates and inclusion.
Outcome Measurement Tool	Accepted in principle; seen as important for demonstrating impact	Co-design with staff and service users; keep brief yet meaningful; focus on person-centred outcomes while aligning with evaluation frameworks.

Intervention Component	Stakeholder Reception	Proposed Refinements
Stakeholder Community Forum	Support for fostering collaboration and reducing duplication	Embed within existing infrastructure; define clear purpose and moderation; manage expectations to reduce platform fatigue.
Provider-Facing Training Video with MI Resources	Viewed as timely and useful for increasing practitioner confidence	Keep modular and time-efficient; integrate into induction training/CPD; include real-world examples and reflective practice components.

6.6 Limitations and Future Directions

While the findings provide meaningful insights into the feasibility and acceptability of the proposed intervention components, several limitations must be acknowledged. The small sample size limits the generalisability of the results and may not fully capture the diversity of views within SP contexts. In particular, the participant group lacked ethnic and gender diversity, which may have shaped the perspectives shared, especially in relation to nature engagement, where perceptions of safety, accessibility, and cultural relevance are known to vary across different groups. Future research should actively seek to engage a wider and more diverse participant base to ensure interventions are inclusive and responsive to varied experiences and needs.

Although the study was qualitative and interpretive in nature, it is important to recognise how the sample composition and research context may have shaped the findings. For example, all participants were based in England, most identified as White British, and the majority were female. These demographic factors may reflect current patterns in SP engagement but also highlight the importance of continuing to address structural and cultural barriers that may limit access to, or representation within NBIs. Future work could explore how these interventions resonate with groups who have historically been underserved or excluded from mainstream SP offers.

This study did not aim to test fully developed tools but instead sought to explore stakeholder responses to early-stage concepts, developed through the IM process. The feedback gathered has offered important direction on what changes or refinements may be needed before progressing to implementation. Across the six components, participants generally supported the underlying ideas but identified a number of practical considerations that will need to be addressed if the interventions are to function effectively in real-world contexts. These included concerns around time, digital exclusion, workflow integration, and sustainability. However, these challenges were seen as surmountable, and the value of the intervention approach itself was largely endorsed.

The next stage of work should involve the iterative development and real-world piloting of selected components. This will allow for the assessment of how interventions are received, accessed, and acted upon in everyday settings, and will offer a clearer understanding of their operational viability. Pilot testing could also explore how different forms of delivery (e.g. practitioner-led vs. self-guided tools) influence engagement and outcomes. Including clear process evaluation within this next phase will be important, particularly in assessing what supports or constrains successful implementation, and how adaptations may be required across settings.

To support this, future work may benefit from revisiting earlier stages of the IM framework, especially Step 2 (matrices of change objectives) and Step 3 (selection of theory-based methods and practical strategies). Returning to these steps would provide an opportunity to build on the current findings and refine intervention elements in ways that are both theory-driven and closely aligned with stakeholder needs. It would also allow for more detailed consideration of how behaviour change is being targeted and supported, and how practitioner roles are positioned in that process.

Involving a broader range of stakeholders in this phase, particularly GPs and other frontline health professionals, will be essential. Participants in the present study highlighted the importance of trust, credibility, and practical support, all of which are shaped by the wider organisational and clinical environment. Since GPs often act as gatekeepers within SP pathways, their perspectives will be key in ensuring that proposed interventions align with existing priorities, workflows, and expectations. Their involvement in co-design processes can help surface system-level constraints and opportunities that may otherwise be overlooked and can strengthen the case for embedding nature-based components into standard care pathways.

The IM framework offers a clear and structured pathway for continuing this work. Step 6, which focuses on implementation and evaluation, encourages early planning for both outcome and process assessment. This study has laid the groundwork for that by identifying what matters most to users and implementers and by clarifying where future testing and refinement should be targeted. As development continues, it will be important to embed evaluation strategies that assess not only what works, but for whom, in what contexts, and why. This will support the creation of interventions that are not only acceptable and feasible but also meaningful, scalable, and sustainable across diverse health and community settings.

6.7 Conclusion

This study explored the perceived feasibility and acceptability of a suite of theory-informed interventions aimed at enhancing engagement with NBIs through SP pathways. Developed using the IM framework and grounded in findings from Studies 1 and 2, concept-level resources were presented to diverse stakeholders, including service users, implementers, and adopters, for critical reflection.

Findings suggest that the proposed components, such as the promotional video, nature needs assessment, interactive map, outcome measurement tool, provider training resources, and community forum, were viewed as both relevant and promising. Participants valued tools that were emotionally engaging, practically useful, and tailored to local contexts. At the same time, concerns were raised around sustainability, digital exclusion, time constraints, and integration with existing systems, pointing to important design and implementation considerations.

Crucially, the study underscores that the success of these interventions depends not only on their content but on the systems into which they are introduced. Effective uptake requires alignment with workforce capacity, service infrastructure, and equitable access across diverse user groups. By engaging implementers and adopters alongside service users, the study captured both individual and structural influences on engagement, highlighting the importance of shared ownership and contextual fit.

Through its co-design approach and application of behavioural theory, this research contributes to the growing field of nature-based and community-centred health promotion. It demonstrates that embedding stakeholder perspectives early in the design process helps identify real-world constraints and opportunities, leading to more acceptable, feasible, and potentially sustainable interventions. As NBSPs continues to evolve, tools that are theory-driven, user-centred, and system-aware will be critical to ensuring that such interventions reach those who stand to benefit most.

Chapter 7 Discussion

7.1 Chapter Overview

This chapter brings together the findings from the three empirical studies and interprets them in relation to the overarching aim and research questions set out in Chapter 1. The central aim of this thesis was to explore how NBSPs can be more effectively and equitably embedded within SP systems to support long-term health behaviour change and reduce the burden of NCDs. In doing so, the thesis sought not only to evaluate the potential impacts of NBSPs, but also to illuminate the mechanisms through which they operate, the barriers that constrain their use, and the conditions that may enable their wider adoption.

The research was guided by four questions:

1. What influence do social prescriptions have on biological, psychological, and social factors influencing health behaviours?
2. What are the similarities and differences between traditional social prescriptions and nature-based interventions in their impact on health behaviour change?
3. Do different stakeholder groups perceive different opportunities and barriers to using social prescriptions, specifically NBIs?
4. How can NBIs be developed and implemented to facilitate their integration within social prescribing pathways?

These questions were addressed through a multi-phase, mixed-methods programme of research. Study 1 (umbrella review) examined the evidence base for SP interventions, including NBIs, and their effects across the three domains of the BPS model of health. Study 2 (qualitative needs assessment) explored the perspectives of service users and practitioners on the opportunities and barriers associated with NBIs, while Study 3 (feasibility and acceptability study) assessed the practical relevance of co-designed intervention tools intended to support the integration of NBIs into SP systems. Chapter 5 documents how findings from Studies 1 and 2 were translated into intervention design using the Intervention Mapping framework, and Chapter 7 sets out considerations for future evaluation and implementation.

The discussion presented here is structured around the four research questions, enabling findings to be considered systematically while also drawing links between the studies. Importantly, this chapter positions the results within the theoretical and conceptual frameworks that informed the research. The BPS model (Engel, 1977; Wade & Halligan, 2017) provides an overarching framework, recognising that health is shaped by biological, psychological, and social processes that interact dynamically. However, the BPS model alone does not specify how behaviour change occurs; it therefore requires integration with more targeted theories of health behaviour change, such as SCT (Bandura, 1986, 2001) and the HBM (Rosenstock, 1974). Environmental psychology theories, such as ART (Kaplan & Kaplan, 1989) and SRT (Ulrich, 1983), also play a central role in explaining why NBIs may exert distinctive effects.

By synthesising findings across the three studies and embedding them within these theoretical perspectives, the chapter aims to provide a comprehensive interpretation of the research outcomes. It demonstrates how NBIs can operationalise the BPS model in practice, highlights the added value of theory in making sense of mechanisms of change, and outlines the implications for intervention design, research, and policy. The chapter also reflects critically on the strengths and limitations of the research before considering its contribution to knowledge and future directions for the field.

7.2 Addressing the Research Questions

The findings of this thesis are best understood when organised around the three research questions outlined in Chapter 1. This structure allows for a systematic examination of the evidence generated across the umbrella review, qualitative needs assessment, and feasibility study, while also enabling a deeper synthesis that cuts across study boundaries. Each question targets a distinct but interrelated aspect of the thesis aim: RQ1 focuses on the biopsychosocial influences of social prescriptions, RQ2 considers the comparative value of NBIs relative to other forms of SP, and RQ3 highlights the perspectives of different stakeholder groups on opportunities and barriers. Together, these questions provide a scaffold for interpreting how NBIs may be effectively embedded within SP systems, while ensuring that the discussion remains anchored in both the empirical findings and the theoretical frameworks that underpin this research.

7.2.1 *RQ1: What influence do social prescriptions have on biological, psychological, and social factors influencing health behaviours?*

While this research question explores how SP influences the biological, psychological, and social factors that shape health behaviours, the studies comprising this thesis were situated within the context of NCD management and prevention. Accordingly, the analysis that follows examines how these biopsychosocial processes operate among populations living with or at risk of long-term conditions. Building on evidence from the umbrella review (Study 1) and qualitative findings from Studies 2 and 3, this section integrates these strands to propose a Biopsychosocial Model of Social Prescribing (BPS-SP). The model conceptualises SP as a systems process through which biological, psychological, and social determinants interact to create the conditions for behavioural engagement and wellbeing.

The umbrella review demonstrated that SP produces measurable outcomes across all domains of the BPS model relevant to NCD management. Biological effects were evident in studies reporting improvements in physiological indicators such as blood pressure, body mass index, and glycaemic control, although the direction and magnitude of change varied and follow-up periods were often short. These findings suggest that SP influences biological functioning indirectly through mechanisms such as stress regulation, increased physical activity, and improved adherence to health advice, pathways central to both the prevention and secondary management of chronic conditions. Psychological outcomes were the most consistent, encompassing reductions in anxiety, depression, and distress, alongside improvements in wellbeing, self-confidence, and perceived quality of life. Such changes align with established evidence linking emotional wellbeing and self-efficacy to adherence, symptom control, and health-related quality of life in NCD populations. Social outcomes were also common, including enhanced social support, reduced loneliness, and greater community connectedness, factors known to protect against morbidity and premature mortality in long-term conditions. Behavioural outcomes such as increased physical activity, participation in community initiatives, and improved self-management often acted as the pathways through which these domain-specific effects became observable. Collectively, this evidence highlights SP as a multidimensional intervention capable of addressing the complex, interacting determinants of NCD risk.

The qualitative findings contextualised these patterns by revealing how people living with, or at risk of, NCDs understood the mechanisms through which SP influences behaviour and wellbeing. Although none of the service-user participants had received a formal social prescription or link-worker support, they consistently identified gaps in existing care that SP could address. While not all participants had a diagnosed condition, many described symptoms, risk factors, or circumstances consistent with early-stage or emerging chronic disease. This reflects the broader public-health reality that prevention and management exist along a continuum, and that most individuals now live with some degree of modifiable NCD risk. Participants described fatigue, fluctuating motivation, and anxiety as everyday barriers to activity and engagement, reflecting the interdependence of biological and psychological constraints typical in long-term condition management. Practitioners and voluntary-sector staff similarly recognised systemic limitations, citing time pressures, funding instability, and fragmented referral systems that hindered holistic support. Both groups valued the potential of SP to legitimise non-medical approaches to care, offering structured encouragement that could bridge clinical and community contexts. These insights underscore that effective SP requires integration across systems and alignment between individual readiness and environmental opportunity, supporting health behaviour change across both preventive and management contexts.

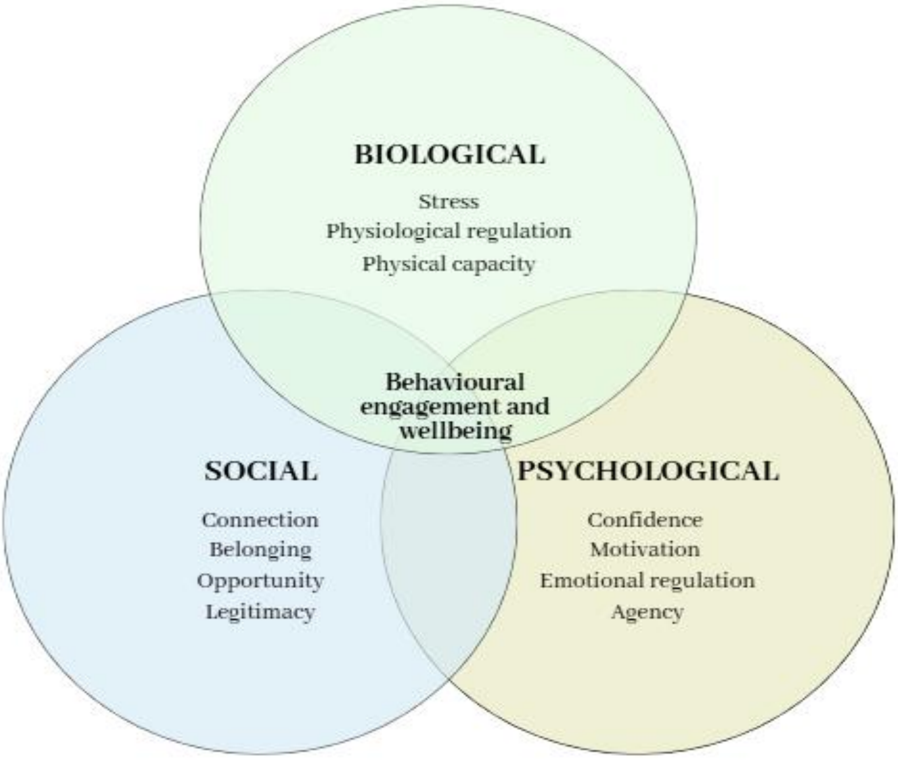
Within the biological domain, improvements in physiological regulation appear where SP facilitates stress reduction and sustained engagement in health-promoting activity. Participants' accounts reinforced that physical capacity, energy, and symptom burden strongly influence willingness and ability to act, emphasising the need for pacing, allowing individuals to modulate activity levels in line with their physical capacity, alongside accessibility and adaptation within SP offers. The psychological domain encompasses the motivational and emotional processes that underpin adherence and self-management in NCDs. Confidence, motivation, and emotional regulation emerged as key influences across studies. Participants highlighted reassurance, encouragement, and professional endorsement as critical to rebuilding self-belief after illness or setback. These processes align with constructs of agency and self-efficacy central to behaviour-change theory and are particularly salient for NCD populations, where cycles of relapse, frustration, and low energy are common.

The social domain captures the relational and contextual enablers that make behaviour change possible. Participants and practitioners emphasised the importance of connection, belonging, and legitimacy, qualities often diminished by long-term illness and isolation (Moensted et al., 2023). SP was viewed as a means of rebuilding social confidence and normalising participation through group activities or community referral. However, structural barriers such as transport, cost, and inconsistent local provision were recognised as limiting factors, suggesting that the reach of SP in NCD contexts depends on equitable access and coordinated delivery. Social factors thus act as both determinants and moderators within the system, shaping the psychological and behavioural pathways through which SP exerts influence.

Integrating these strands, the BPS-SP model (Figure 7-1) conceptualises SP as an interdependent system in which biological, psychological, and social processes converge to generate behavioural engagement and wellbeing. Biological readiness, reflected in energy, stress regulation, and physical capacity, provides the physiological foundation for change. Psychological mechanisms such as confidence, motivation, and agency supply the cognitive and emotional drive, while social factors such as connection, belonging, opportunity, and legitimacy create the contextual scaffolding that enables participation. Behavioural engagement, including self-management, adherence, and re-establishment of healthy routines, emerges downstream from the alignment of these domains. When coherence is achieved across them, positive feedback loops occur, social connection supports emotional wellbeing, psychological resilience facilitates sustained activity, and perceived physical improvement reinforces motivation and participation. Conversely, misalignment, such as high motivation but low capacity, or opportunity without confidence, can disrupt engagement. Surrounding these processes are contextual moderators identified across the qualitative data, including workforce capacity, equity, accessibility, and continuity of support, which determine whether SP functions effectively for those living with or at risk of NCDs.

Figure 7-1

The Biopsychosocial Model of Social Prescribing (BPS-SP) in the context of NCD management and prevention.



Although biopsychosocial framing is widely invoked in SP literature, existing uses have remained partial or descriptive in ways that the present model explicitly addresses. O’Sullivan et al. (2023) drew on BPS principles to argue that SP could strengthen the social dimension of care for musculoskeletal patients, but their analysis was domain-specific and did not theorise how biological, psychological, and social processes interact across the full model. Scarpetti et al. (2024) positioned SP as aligned with the BPS approach in a cross-national policy context, yet their focus was on implementation variation rather than the mechanisms through which biopsychosocial change occurs. Aughterson (2022) went further by examining SP mechanisms across BPS domains in mental-health settings, identifying relevant processes within each domain, but stopped short of integrating these into a unified model that specifies how the domains interact or reinforce one another. Islam (2020) situated SP within holistic, person-centred practice aligned with BPS values but did not attempt to theorise the mechanisms or feedback processes through which SP exerts influence. Collectively, these studies demonstrate that while BPS terminology has become part of SP discourse, it has functioned primarily as a rhetorical orientation rather than an explanatory framework. The BPS-SP model developed in this thesis addresses this gap in four specific respects: it specifies the mechanisms through which SP operates within each domain (rather than listing outcomes); it models the reciprocal feedback loops between domains (rather than treating them as parallel but separate); it identifies contextual moderators that determine whether biopsychosocial alignment is achieved; and it positions behaviour as the downstream expression of that alignment, providing a systems-level account of how and why SP produces change in the context of NCD management and prevention.

Figure 5 illustrates this model, depicting social prescribing as an interdependent system in which biological, psychological, and social processes interact to produce behavioural engagement and wellbeing. In summary, the BPS-SP model provides a theoretically grounded synthesis of how SP influences the interconnected determinants of health behaviour in NCD management and prevention. It conceptualises behaviour as the downstream expression of biopsychosocial alignment, offering a coherent framework for understanding how SP supports wellbeing and sustained engagement among people with long-term conditions. By integrating evidence of biological, psychological, and social mechanisms with the lived realities of NCD, the model extends the BPS framework to applied public-health practice. It provides a foundation for designing and evaluating interventions that address multiple determinants of NCD risk simultaneously, highlighting that meaningful behaviour change emerges not from individual motivation alone but from the reciprocal interaction of biological capability, psychological readiness, and social opportunity.

7.2.2 *RQ2: What are the similarities and differences between traditional social prescriptions and nature-based interventions in their impact on health behaviour change?*

The second research question examined whether NBIs differ from more traditional forms of SP, such as arts activities, peer-support groups, and exercise referrals, in their capacity to influence health behaviours relevant to NCD management and prevention. Findings from the umbrella review, supported by qualitative insights, indicate that while NBIs share many of the psychological and social benefits of traditional SP, they may offer distinctive value through their ability to engage multiple biopsychosocial processes concurrently. For example, evidence from the umbrella review showed that NBIs such as green exercise, horticulture, and conservation volunteering produced greater reductions in blood pressure and stress markers than indoor or non-nature equivalents, alongside consistent improvements in mood, vitality, and social connectedness (Hanson & Jones, 2015; Rogerson et al., 2016; Struthers et al., 2024). However, this potential is not consistently realised in practice, and significant structural and conceptual challenges remain.

Traditional SP activities such as arts- and culture-based programmes, volunteering schemes, and exercise referrals have demonstrated reliable biopsychosocial benefits. Arts prescriptions have been associated with improvements in mood, confidence, and emotional regulation, alongside reductions in isolation and loneliness (Chatterjee et al., 2017; Chen et al., 2024). Exercise referral schemes have shown measurable physical improvements, including reductions in BMI and blood pressure, while also enhancing self-esteem and, to a lesser extent, social connectedness (Patil et al., 2018). Peer- and volunteer-based programmes similarly foster belonging, purpose, and community cohesion, although evaluation quality remains variable (Pescheney et al., 2019; Bock et al., 2014). Collectively, these findings demonstrate that existing, non-nature-based SP models deliver substantial biopsychosocial benefits, particularly within the psychological and social domains that underpin health behaviour. Yet, as identified in the umbrella review, few studies conceptualise how these domains interact, limiting understanding of the mechanisms through which change occurs.

NBIs appear to extend this evidence base by engaging biological, psychological, and social domains simultaneously through immersion in natural environments. Comparative reviews show that outdoor programmes deliver stronger physiological effects than indoor activities, reducing blood pressure and heart rate, and are associated with greater adherence and enjoyment (Hanson & Jones, 2015; Struthers et al., 2024). Psychological outcomes are similarly pronounced, with consistent improvements in mood, attention, and vitality, and reductions in anxiety (Rogerson et al., 2016; Marselle et al., 2019). Higher retention and satisfaction rates observed in walking groups and green exercise schemes suggest that nature-based contexts may better sustain motivation than gym- or clinic-based programmes. These patterns align with theoretical perspectives that explain the synergistic effects of environmental and psychosocial mechanisms: SRT (Ulrich, 1983) highlights physiological regulation through contact with nature; ART (Kaplan & Kaplan, 1989) accounts for cognitive and emotional recovery; and SCT (Bandura, 1986, 2001) emphasises the role of self-efficacy and social reinforcement in sustaining participation. Together, these frameworks demonstrate how NBIs combine environmental, psychological, and social mechanisms rarely achieved through single-modality SP interventions.

As discussed in Chapter 1, NBIs have been theorised to address the clustered risk factors underpinning many NCDs. The findings of this research refine and contextualise that proposition. Evidence from the umbrella review (Study 1) showed that NBIs often integrate physical activity, social participation, and outdoor exposure, producing improvements across physiological, psychological, and social outcomes. These multi-domain effects contrast with other SP modalities that, while occasionally measuring outcomes across BPS domains, tend to emphasise one dominant pathway, for example, arts and culture-based prescriptions focus on psychosocial wellbeing (Chatterjee et al., 2017; Chen et al., 2024), whereas exercise referral schemes demonstrate clear physical and psychological benefits but limited integration across domains (Patil et al., 2018). The qualitative findings (Studies 2 and 3) highlighted that this potential is seldom realised due to limited awareness, inconsistent referral pathways, and uncertainty about NBSPs' legitimacy within healthcare systems, challenges also recognised in the wider SP literature (Bickerdike et al., 2017; Husk et al., 2020). Interpreted through the Biopsychosocial Model of Social Prescribing (BPS-SP), these findings suggest that while NBIs are conceptually well positioned to engage multiple determinants in parallel, their effectiveness depends on integration within existing systems, practitioner confidence, and equitable access. The BPS-SP model therefore provides a theoretical and empirical lens for understanding both the mechanisms through which NBIs influence health and the contextual barriers that constrain this potential (Barnett et al., 2012; Beaglehole et al., 2011; WHO, 2018).

To address these gaps, the intervention package developed through this research translates theoretical mechanisms into accessible, system-ready tools. The public-facing video provides modelling and cues to action, reflecting constructs from SCT and the HBM by enhancing self-efficacy and perceived benefit. The interactive map increases environmental opportunity by improving awareness of local restorative spaces, while the wellbeing tracker supports self-regulation and reflection. Together, these resources address informational, environmental, and behavioural barriers, ensuring that the distinctive biopsychosocial potential of NBIs can be realised in practice. They also directly respond to the determinants of NCD risk identified across the thesis by promoting sustained engagement in stress-reducing, socially connected, and physically active behaviour.

In summary, while NBIs share many of the psychosocial benefits of traditional SP, their distinctive contribution lies in engaging overlapping biological, psychological, and social mechanisms that collectively target the interlinked determinants of NCD risk. Their effectiveness, however, depends on integration within existing SP systems, practitioner engagement, and sustained user participation. By embedding NBSPs within established infrastructures and supporting them through theory-informed digital and behavioural tools, the intervention developed in this research translates conceptual potential into practical mechanisms for behaviour change and disease prevention.

7.2.3 *RQ3: Do different stakeholder groups perceive different opportunities and barriers to using social prescriptions, specifically NBIs?*

The third research question explored how different stakeholder groups, potential service users, link workers, healthcare professionals, and community providers, perceive the opportunities and barriers associated with social prescriptions, and with NBSPs in particular. The qualitative needs assessment and feasibility study showed that while stakeholders broadly recognised the value of NBSPs, they identified distinct challenges and enablers that reflected their roles and contexts. These insights informed the co-designed intervention package, ensuring that proposed tools addressed barriers at individual, practitioner, and system levels.

Potential service users described practical and psychological barriers such as time pressures, competing responsibilities, lack of transport, and low confidence. Digital exclusion was also identified as a significant obstacle. These concerns mirror wider evidence that inequalities in access to green space, safety concerns, and environmental quality constrain participation (Jennings et al., 2016; Shanahan et al., 2015). Importantly, these barriers also map directly onto the social determinants of NCDs: lower-income groups disproportionately experience limited access to safe environments, higher exposure to stress, and fewer resources to engage in preventive health behaviours, all of which increase risks of obesity, diabetes, and CVD (Marmot et al., 2020; Beaglehole et al., 2011). Addressing these barriers through NBSP design therefore has dual value: enabling participation in specific programmes while also contributing to the reduction of inequalities in NCD outcomes. The intervention addresses these needs through resources that normalise participation and highlight accessible, high-quality opportunities, offering users both reassurance and practical guidance.

Practitioners reported systemic barriers including heavy workloads, limited time, and uncertainty about their role in recommending NBSPs. They also highlighted issues of legitimacy, noting that NBIs were often viewed as less credible than structured exercise or clinical referrals (Fixsen et al., 2020). These barriers are significant in the context of NCD prevention: if practitioners lack confidence or time to promote NBSPs, opportunities to intervene early with at-risk individuals may be missed, particularly for those with multiple or emerging risk factors. To address these concerns, the package incorporates a provider-facing training video and MI resources designed to enhance practitioner confidence, equip them with language for discussing NBSPs, and embed them credibly within referral conversations. By improving the quality and consistency of referrals, these resources strengthen the role of practitioners as critical agents of NCD prevention.

Community providers emphasised the challenges of short-term funding, resource constraints, and fragmented provision, issues also noted in the wider literature (Bickerdike et al., 2017). They stressed the importance of building legitimacy and sustainable partnerships with healthcare providers and local authorities. Recent research with third-sector organisations in Scotland similarly found that targeted referrals, experienced link workers, and consistent follow-up were associated with improved outcomes, whereas scattergun referral approaches, resource constraints, and power imbalances undermined collaboration and effectiveness (Albutt et al., 2025). Such relational and structural dynamics matter for NCD prevention, since inconsistent pathways risk leaving high-risk populations unsupported (Marmot et al., 2020). The proposed stakeholder community forum directly responds to these issues by creating a structured mechanism for knowledge-sharing and equitable partnerships, fostering collective agency and shared legitimacy across sectors (Bandura, 2001). In this way, the intervention builds capacity not only at the individual and practitioner level but also within the wider system that sustains NBSPs.

Agency emerged as a unifying theme: potential service users relied on proxy agency to begin participation, collective agency supported motivation in groups, and some developed personal agency over time (Bandura, 2001). The co-designed tools are structured to support this progression by offering cues to action (HBM; Rosenstock, 1974), fostering collective participation (SCT; Bandura, 1986, 2001), and enabling sustained self-regulation and restoration of directed attention (SCT; Bandura, 1986; ART; Kaplan & Kaplan, 1989, 1995). This progression has direct relevance for NCD prevention, since enhancing agency is essential for sustaining behaviour change in areas such as physical activity, diet, and stress management (Beaglehole et al., 2011). By integrating resources that address barriers across multiple levels, the package ensures NBSPs are not ad hoc offerings but embedded, sustainable elements of SP pathways that contribute to reducing NCD risk at both individual and population levels.

These insights highlight that while stakeholders recognised the value of NBSPs, they also identified the conditions required for success. By aligning intervention components with these insights, the proposed tools provide practical mechanisms to overcome barriers at individual, practitioner, and system levels, positioning NBSPs as credible, sustainable contributions to SP and to wider efforts in NCD prevention.

7.2.4 *RQ4: How can NBIs be developed and implemented to facilitate their integration within social prescribing pathways?*

The fourth research question asked: How can NBIs be developed and implemented to facilitate their integration within social prescribing pathways? This question is addressed across three interconnected strands of discussion. First, the intervention development process is examined, showing how the needs and barriers identified in Studies 1 and 2 directly informed the design of each intervention component through the Intervention Mapping framework. Second, the feasibility and acceptability findings from Study 3 are interpreted to assess whether the co-designed tools are viable and acceptable within real-world SP contexts. Finally, considerations for future evaluation and implementation are outlined, drawing on IM Steps 5 and 6 to set out what a robust evaluation of this intervention would require.

Together, these strands demonstrate how a theoretically grounded, participatory approach to intervention development can translate research findings into practical, system-ready tools for nature-based social prescribing. This directly addresses a well-documented gap in the SP literature: without a robust theoretical framework, it becomes difficult to understand mechanisms of action, evaluate efficacy, or ensure replicability

(Davidoff et al., 2015; Prestwich et al., 2014). The Intervention Mapping framework, widely applied in complex health intervention development across a range of conditions (Bartholomew Eldredge et al., 2016; Skivington et al., 2021), provides precisely this structure, offering a systematic, evidence-based pathway from needs assessment through to evaluation planning. Applied here to NBIs within SP, it demonstrates that the kind of theory-informed, participatory development process called for in the literature is not only feasible but capable of producing contextually grounded, acceptable tools, moving the field beyond the 'optimism rather than robust evidence' that has characterised NBSP policy to date (Wilkie & Davinson, 2021a).

7.3 Theoretical Integration and Reflection

The findings across the four research questions show that SP interventions rarely act on a single health domain in isolation. Instead, improvements tend to emerge through cascading effects, where psychological restoration enables social engagement, social connection reinforces behavioural adherence, and sustained participation may produce biological benefits (Kelly & Barker, 2016; Marselle et al., 2019). This dynamic interplay exemplifies the BPS model in practice and demonstrates why NBSPs are well positioned to activate multiple pathways simultaneously.

Theories of behaviour and environment help to explain the mechanisms through which NBSPs influence engagement and sustained change. SCT (Bandura, 1986, 2001) clarifies how agency develops from proxy (through practitioner guidance), to collective (through group participation), to personal (through growing confidence and autonomy), reflecting the progression observed across stakeholder accounts. HBM (Rosenstock, 1974) complements this by highlighting the importance of perceived legitimacy, benefit, and barriers in shaping engagement, particularly the role of practitioner endorsement as a cue to action (Fixsen et al., 2020). SRT (Ulrich, 1983) and ART (Kaplan & Kaplan, 1989) explain why natural environments add distinctive value, through physiological regulation and cognitive restoration, with environmental quality acting as a key moderator of outcomes (Hartig et al., 2014; Shanahan et al., 2015). Taken together, these frameworks map onto the biopsychosocial domains of the BPS-SP model: SRT and ART represent biological and environmental processes, HBM captures psychological determinants of motivation and perceived control, and SCT links these to social interaction and behavioural reinforcement.

This integration advances existing theory by providing a multi-level explanation of how social prescriptions operate, not just in terms of what they deliver, but how they create the relational, motivational, and environmental conditions for sustained behaviour change. Within the intervention package, these theoretical constructs are translated into practice: the public-facing video and provider training materials model behaviour and enhance self-efficacy (SCT); the wellbeing tracker provides feedback and reinforcement to strengthen perceived benefit (HBM); and the interactive map encourages engagement with high-quality environments that support restoration and stress regulation (SRT/ART). This explicit mapping of determinants to outcomes represents a significant conceptual and practical advance beyond existing SP approaches, which have often been criticised for their lack of mechanistic clarity.

Recent policy analysis of Scottish outdoor recreation strategies illustrates the need for more precise, theory-driven approaches to behaviour change. Existing initiatives have often relied on broad promotion and environmental enhancement, focusing on access or participation targets without articulating the mechanisms or measurable outcomes that drive sustained engagement (Smith et al., 2025). The theoretically integrated approach developed in this thesis addresses this gap by translating core behavioural and environmental theories into an applied intervention framework. Each component of the intervention package was designed to operationalise specific change processes identified through the BPS-SP model.

The public-facing video models achievable behaviours and highlights relatable experiences, using observational learning and vicarious reinforcement to strengthen self-efficacy and perceived benefit, mechanisms derived from SCT and the HBM. The interactive map enhances environmental opportunity and perceived control by helping users identify safe, accessible, and high-quality natural spaces, directly engaging the environmental and biological mechanisms described in SRT and SRT. The wellbeing tracker supports self-regulation and feedback, allowing users to monitor progress and reflect on changes in mood, energy, and activity levels, reinforcing self-efficacy and intrinsic motivation (SCT, HBM). The provider-facing training video and MI resources equip practitioners with the confidence and language to act as credible cues to action, bridging proxy and personal agency and fostering supportive social contexts. Finally, the stakeholder forum sustains collective agency and legitimacy by connecting providers, practitioners, and community organisations, addressing the system-level enablers within the social dimension of the BPS-SP model.

The integration of these theories moves SP beyond descriptive accounts of "what works" toward mechanistic understanding of how and why. This addresses a recurring critique that SP is often presented as a "black box" intervention (Davidoff et al., 2015; Husk et al., 2020). The analysis here demonstrates that theory is not an optional add-on but a practical tool for designing, evaluating, and embedding complex interventions in ways that are replicable and scalable (Prestwich et al., 2014; Skivington et al., 2021).

7.4 Strengths

A key strength of this thesis lies in its deliberate integration of theory, evidence, and stakeholder insight within a single, coherent programme of research. SP is often evaluated in fragmented ways, with studies focusing either on outcomes or experiences but rarely combining these with theoretical explanation (Husk et al., 2020). By employing a multi-phase, mixed-methods design, this thesis was able to triangulate evidence across different levels of analysis. The umbrella review provided a broad overview of existing outcomes across biological, psychological, and social domains; the qualitative needs assessment generated in-depth understanding of mechanisms and barriers; and the feasibility study tested the acceptability of co-designed solutions in practice. This sequential design allowed each study to build on the insights of the previous one, creating a cumulative body of evidence that is both comprehensive and responsive to real-world contexts.

Another strength is the explicit use of the BPS model as the guiding framework. While the BPS model has long been recognised as a valuable conceptual foundation, it is often criticised for being too abstract to guide intervention development (Ogden, 2016). This thesis demonstrated how the model can be operationalised by integrating behaviour change theories, such as SCT (Bandura, 1986, 2001) and the HBM (Rosenstock, 1974), alongside environmental psychology frameworks like ART (Kaplan & Kaplan, 1989) and SRT (Ulrich, 1983). Through this integration, the thesis moves beyond descriptive accounts of nature’s benefits and shows how specific mechanisms, such as agency, self-efficacy, risk perception, and environmental restoration, can be targeted within intervention design. In doing so, it contributes to advancing theoretical sophistication within SP research, an area often criticised for its lack of mechanistic clarity (Davidoff et al., 2015; Prestwich et al., 2014).

The participatory orientation of the research further strengthens its contribution. By engaging stakeholders, including potential service users, link workers, and community providers, at multiple stages, the research ensured that the intervention design was grounded in lived realities rather than imposed from abstract theory. This co-design approach enhanced ecological validity and helped to surface barriers, such as digital exclusion and organisational role ambiguity, that may not have been visible through quantitative measures alone. It also increased the likelihood that the resulting intervention tools would be both acceptable and feasible in practice. This aligns with wider calls for health interventions to adopt co-production as a means of improving relevance, equity, and sustainability (O'Cathain et al., 2019; Skivington et al., 2021).

Finally, the thesis makes a methodological contribution by demonstrating the value of IM in the context of SP. IM provided a structured, stepwise process that required transparency at every stage, from identifying behavioural determinants to linking them with theory-based methods and practical applications. This rigour contrasts with much of the existing SP literature, which often lacks detail on how interventions are developed or why specific components are included. By applying IM, the thesis not only produced a contextually grounded intervention but also provided a replicable template that can inform the design of future NBSPs and other complex interventions.

Taken together, these strengths ensure that the contributions of this thesis are not limited to a single empirical study or theoretical perspective. Instead, the research demonstrates how multiple strands of evidence and theory can be woven together to address a pressing public health challenge: how to design and embed nature-based social prescriptions that are both effective and equitable.

7.5 Limitations

While this thesis makes a number of important contributions, it is also necessary to acknowledge its limitations. These reflect both the constraints of the existing evidence base and the methodological choices made within the research programme. Recognising these limitations provides context for interpreting the findings.

One limitation arises from the heterogeneity and variable quality of the evidence synthesised in the umbrella review. Although the review drew together findings from twelve systematic reviews, the included studies varied substantially in design, population, and outcome measures. Biological outcomes were the most frequently assessed, particularly blood pressure and BMI, yet results were inconsistent across other physiological markers such as cholesterol, glucose, and cortisol, and follow-up periods were often short. Psychological outcomes were more consistently reported but rarely examined longitudinally. Social outcomes were the least systematically measured, with many studies relying on proxy indicators or qualitative descriptions rather than validated tools. This unevenness restricted the ability to draw robust conclusions about the full biopsychosocial impact of SP, and especially the distinctive contributions of NBIs. Moreover, the methodological quality of some included reviews was moderate, with small sample sizes, lack of control groups, and short follow-up periods limiting confidence in the findings. These constraints reflect wider challenges in the SP evidence base and underscore the need for more rigorous and standardised evaluation frameworks (Bickerdike et al., 2017; Husk et al., 2020).

A second limitation relates to the scope and representativeness of the qualitative data. The needs assessment and feasibility study involved stakeholders from particular communities and healthcare contexts, which provided rich insights but may not capture the full diversity of experiences across populations. For example, while digital exclusion and transport barriers were prominent themes, other factors such as cultural perceptions of nature, rural–urban differences, and intersectional inequalities may not have been fully explored. Similarly, while link workers and potential service users were well represented, the perspectives of GPs and commissioners were less prominent, limiting understanding of system-level decision-making. As with all qualitative research, the findings should be interpreted as contextually grounded rather than universally generalisable.

Finally, the literature synthesis and empirical studies did not allow for strong comparative conclusions between NBSPs and other forms of SP. Few studies have directly contrasted modalities under equivalent conditions (Husk et al., 2020), meaning that claims about the distinctiveness of NBSPs remain suggestive rather than definitive.

In sum, these limitations do not undermine the contributions of the thesis but situate them within the realities of an emerging evidence base and the constraints of conducting research in applied, real-world contexts.

7.6 Next Steps in the Intervention Mapping Process

IM provides a structured, iterative framework for the design, adoption, and evaluation of complex health interventions (Bartholomew Eldredge et al., 2016). This thesis has completed the early phases of IM, including problem identification, needs assessment, the specification of behavioural and environmental outcomes, and the development of matrices of change objectives. These steps culminated in the co-design of a prototype intervention package that was tested for feasibility and acceptability. The next stages of IM, Step 5, planning for adoption and implementation, and Step 6, planning for evaluation, remain to be undertaken, and it is important to reflect on how these can be shaped by the empirical and theoretical insights generated in this thesis.

7.6.1 *Step 5: Planning for Adoption and Implementation*

To move the intervention into practice, a clear and collaborative strategy for implementation is required. The findings from Chapters 4 and 6 underscore the importance of relational trust, role clarity, and accessible tools in supporting engagement (Fixsen et al., 2020). Therefore, implementation efforts should focus on building capacity across stakeholder groups, especially link workers, practice staff, and community providers.

This might include the development of training resources tailored to specific roles, with a focus on emotionally informed practice, communication skills, and the use of co-designed tools. These materials should reflect the key principles established in earlier stages, such as the importance of emotional safety, permission, autonomy, and connection, and be grounded in the behavioural and environmental theories used in this thesis (e.g., Bandura, 1986; Kaplan & Kaplan, 1989; Rosenstock, 1974; Ulrich, 1983).

Practical integration will also require attention to workflow alignment. Co-designed tools such as the digital green space map, the nature needs assessment, and the outcome tracking sheets (Chapter 6) should be embedded into existing SP referral processes in a way that supports rather than burdens frontline staff. Feedback from implementers suggested that ease of use, flexibility, and minimal duplication of effort will be critical to adoption (Chapter 4).

In addition, ongoing dialogue between health services and community organisations will be essential to ensure that expectations are realistic, referral pathways are clear, and resources are in place to support delivery. While this thesis did not complete a full systems-level implementation plan, the groundwork has been laid for future collaboration and adaptation at local or regional levels.

7.6.2 *Step 6: Planning for Evaluation*

The final stage of the IM process involves planning how the intervention will be evaluated once implemented. Given the complex, relational nature of SP and NBSPs, evaluation must extend beyond clinical outcomes to include experiential, behavioural, and process-related indicators (Bragg & Atkins, 2016; Greenhalgh et al., 2016).

A mixed-methods approach is recommended for evaluating the intervention’s impact. Quantitative measures should capture key biopsychosocial and behavioural outcomes, including changes in mental wellbeing, social connectedness, nature engagement, and health-related behaviours. These indicators can provide insight into both immediate and sustained effects of participation. To complement this, qualitative feedback from potential service users, link workers, and community providers should be gathered to explore lived experience, perceived value, and contextual factors influencing engagement and impact. Together, these data sources will support a more holistic understanding of what works, for whom, and under what conditions (as explored in Chapters 4 and 6).

Process evaluation should assess how the intervention is used in real-world settings, including acceptability, fidelity, and accessibility (Bartholomew Eldredge et al., 2016). This will be especially important for identifying whether the tools developed are adaptable to different populations, and whether they reduce or reinforce existing inequalities in access to SP and nature.

Finally, evaluation should be iterative and collaborative, involving stakeholders in interpreting findings and refining the intervention over time. This approach aligns with the participatory ethos of this thesis and increases the likelihood that the intervention will remain relevant, feasible, and embedded in practice (Greenhalgh et al., 2016; O'Cathain et al., 2019). It is recognised, however, that the feasibility of evaluation and longer-term implementation is contingent on resource availability. In contexts where funding constraints limit delivery, evaluation evidence demonstrating positive outcomes may itself play a crucial role in securing future investment and supporting the case for sustainability.

7.7 Implications and Recommendations

The findings of this thesis carry significant implications for how NBSPs are understood, designed, and embedded within SP systems, and for how future research and policy might advance their development. At a public health level, the work reinforces the potential of NBSPs as upstream interventions for the prevention and management of NCDs. By influencing blood pressure, BMI, stress regulation, and social connectedness, NBSPs directly target modifiable risk factors for CVD, type 2 diabetes, and depression (GBD 2019 Risk Factors Collaborators, 2020; WHO, 2018). This positions NBSPs not merely as supplementary wellbeing initiatives, but as integral components of prevention strategies aimed at reducing the long-term burden on overstretched healthcare systems.

In terms of practice, the findings underline that NBSPs will only succeed if they are delivered in ways that align with the BPS model in both principle and execution. Potential service users consistently valued psychological restoration, social contact, and the legitimacy conferred by practitioner endorsement, indicating that engagement depends as much on context and scaffolding as on the intrinsic appeal of nature itself. Practitioners therefore require time, training, and resources to act as credible conduits, while environments into which people are referred must be safe, inclusive, and restorative. The co-designed tools, needs assessment, video resources, interactive map, outcome tracker, and stakeholder forum, work together to create such conditions by lowering informational barriers, strengthening practitioner confidence, enhancing environmental visibility, and fostering collaborative legitimacy.

The applicability of these tools is not confined to formal healthcare pathways. They also have potential in everyday contexts where individuals may be at elevated risk but not yet engaged in clinical care. For example, up to 50% of women with gestational diabetes develop type 2 diabetes within 5–10 years postpartum, with an 8–10-fold increased lifetime risk compared to normal glycaemic pregnancies (FIGO, 2021). Early parenting and postnatal services could integrate the needs assessment tool to support new mothers in reflecting on self-care, navigating feelings of guilt or overwhelm, and identifying acceptable routes into community-based activity. Similarly, workplace wellbeing and occupational health programmes could use the interactive map or wellbeing tracker to engage employees experiencing stress, fatigue, or difficulty accessing traditional health services. Embedding NBSP resources into these everyday systems offers a proactive means of prevention, expanding their reach to populations who may not otherwise access SP and contributing to the reduction of NCD risk across the life course. This illustrates the broader applicability of the intervention tools across diverse care and wellbeing pathways, highlighting their potential to bridge gaps between clinical and community-based forms of prevention.

The findings also make clear that the success of SP depends not only on individual engagement but on the quality of referral processes, practitioner confidence, and inter-organisational collaboration. As highlighted in the literature and stakeholder perspectives earlier in this chapter, inconsistent referrals, resource pressures, and legitimacy gaps undermine trust and effectiveness (Albutt et al., 2025; Bickerdike et al., 2017; Fixsen et al., 2020). The intervention package developed here provides structured responses to these challenges: provider training and motivational resources strengthen referral quality and practitioner credibility; outcome tracking enhances accountability and supports measurable progress; and the stakeholder forum fosters equitable partnerships and collective agency across sectors (Bandura, 2001).

At the policy level, current national strategies for outdoor recreation and health promotion often rely on broad messaging or environmental improvements, with little clarity about behavioural mechanisms or how success will be evaluated (Husk et al., 2020; Smith et al., 2025). By contrast, the thesis demonstrates how theory-driven tools, such as needs assessment, practitioner training, and outcome tracking, can clarify behavioural targets, embed measurable outcomes, and align local initiatives with national prevention goals (Prestwich et al., 2014; Skivington et al., 2021). In doing so, the intervention model offers a practical framework for moving beyond promotional rhetoric toward systematic, accountable delivery.

The implications for policy flow directly from these practice considerations. Without secure, long-term investment, NBSPs risk remaining dependent on short-term projects and the goodwill of community organisations, undermining their sustainability and reach. Policy frameworks must recognise green infrastructure and community-based assets as integral components of the public health system, and resource the VCSE sector accordingly to deliver them at scale. The recent 10 Year Health Plan for England sets out three radical shifts, from hospital to community, from analogue to digital, and from sickness to prevention (Department of Health and Social Care, 2025). This new strategic direction aligns closely with the findings of this thesis, which show how NBSPs can operationalise these ambitions via biopsychosocial mechanisms targeting NCD prevention, self-management, and health inequalities. Embedding NBSPs fully within PCNs, commissioning structures, and national outcome frameworks would support their transition from peripheral innovation to mainstream provision. Moreover, integrating outcome measurement tools that capture changes across biological, psychological, social, and behavioural domains can generate the robust, multidimensional evidence needed to secure long-term investment and demonstrate the contribution of NBSPs to the NHS's prevention and population health goals.

The wider implications extend beyond healthcare to broader debates about environmental justice, equity, and sustainability. By demonstrating that NBSPs operationalise the biopsychosocial model, this thesis highlights that health is not solely an individual responsibility but is shaped by environments and opportunities. In this sense, NBSPs align with global agendas on sustainable cities, climate adaptation, and health equity. Investment in high-quality green spaces should therefore be seen as a public health intervention, capable of reducing NCD burden, strengthening community resilience, and promoting social cohesion.

Finally, these implications point toward clear priorities for future research: longitudinal evaluations to assess sustained impact, comparative studies to establish distinctiveness, and equity-focused investigations to ensure interventions reach underserved groups. Methodologically, the integration of IM, theory, and stakeholder co-design demonstrated here should be tested across different contexts to establish scalability. By addressing these priorities, the field can build a cumulative evidence base that positions NBSPs as both effective and equitable components of SP systems and as central contributors to NCD prevention.

7.8 Contribution to Knowledge

This thesis contributes to knowledge in several interrelated ways, spanning conceptual, empirical, practical, and policy domains. Collectively, these contributions address the longstanding challenge of explaining how and why SP influences health, moving the field beyond descriptive evaluations toward a mechanistic, biopsychosocial understanding. The research advances theory through the development of the BPS-SP, strengthens the empirical evidence base on SP and NBIs in the context of NCD management and prevention, and translates these insights into an applied, co-designed intervention package. In doing so, it constitutes the creation and interpretation of new knowledge through original research, extending both theoretical understanding and practical application within the field. Together, these elements demonstrate how integrating behavioural, environmental, and psychosocial theory can inform the design and implementation of scalable, system-ready approaches to health behaviour change.

A central contribution lies in the development of the BPS-SP, which provides a new theoretical framework for understanding how SP influences health across the biological, psychological, and social spectrum in ways directly relevant to the management and prevention of NCDs. The model integrates findings from across the studies to illustrate how SP functions as a systems process in which biological readiness, psychological capability, and social opportunity interact to generate behavioural engagement and wellbeing. By positioning behaviour as the downstream expression of biopsychosocial alignment, the BPS-SP model moves beyond descriptive accounts of SP to explain how and why it influences health behaviour. In doing so, it bridges long-standing conceptual divides between biomedical, behavioural, and social approaches to NCD prevention. Crucially, this constitutes an original theoretical contribution: while prior studies have invoked BPS principles in SP contexts (O'Sullivan et al., 2023; Scarpetti et al., 2024; Aughterson, 2022; Islam, 2020), none has formalised a unified model that specifies inter-domain mechanisms, reciprocal feedback loops, contextual moderators, and behaviour as a downstream outcome, the features that distinguish the BPS-SP from existing descriptive or domain-specific uses of the BPS framework in this literature (see 7.2.1).

Empirically, the model is grounded in evidence showing that SP, and NBSPs in particular, affect the same mechanisms that drive NCD risk and progression. By synthesising data on biological, psychological, social, and behavioural outcomes, the research demonstrates that NBIs can positively influence blood pressure, BMI, stress regulation, self-efficacy, and social connectedness, factors that map directly onto major NCD risks such as cardiovascular disease, type 2 diabetes, and depression (WHO, 2018; GBD 2019 Risk Factors Collaborators, 2020). These findings challenge the tendency within both research and policy to evaluate SP primarily through short-term wellbeing metrics, showing instead its potential to reduce long-term disease burden through interconnected, multi-domain pathways articulated within the BPS-SP framework.

Conceptually and theoretically, the thesis advances the field by integrating multiple complementary frameworks, SCT (Bandura, 1986, 2001), the HBM (Rosenstock, 1974), SRT (Ulrich, 1983), and ART (Kaplan & Kaplan, 1989), within the overarching lens of the BPS (Engel, 1977; Wade & Halligan, 2017). The BPS-SP model synthesises these perspectives to provide a mechanistic account of how SP generates change, addressing the "black-box" problem identified in intervention research (Davidoff et al., 2015; Husk et al., 2020). It clarifies how agency, motivation, and environmental opportunity interact across domains, and how these processes correspond to NCD pathways, for example, how increased self-efficacy and agency support adherence to physical-activity and self-care routines, while attentional and stress-regulation processes influence metabolic and cardiovascular outcomes. In this way, the model contributes original theoretical insight by mapping specific behaviour-change mechanisms onto biopsychosocial determinants of NCDs.

A further methodological and applied contribution lies in the use of the Intervention Mapping framework to guide the development of a co-designed intervention package of practical tools. These include a nature-needs assessment, public-facing and provider-facing videos, an interactive map, MI resources, an outcome tracker, and a stakeholder forum. Each tool operationalises a specific component of the BPS-SP model, strengthening social opportunity, building psychological capability, or supporting biological readiness through behaviour. Together, these tools address gaps identified in the evidence and by stakeholders, clarifying referral pathways, strengthening practitioner legitimacy, enhancing accessibility, and embedding outcome measurement across domains. By applying this structured, theory-informed process, the research demonstrates the ability to conceptualise, design, and implement a project for the generation of new knowledge, producing applied, implementable resources that embody the biopsychosocial principles later consolidated within the BPS-SP model.

The research also contributes empirically by foregrounding the perspectives of potential service users, practitioners, and community providers, providing the experiential data that informed the BPS-SP model. The findings highlight how barriers to engagement, digital exclusion, safety concerns, and questions of legitimacy, mirror the social determinants of NCD risk. Populations with the least access to safe environments or consistent referral pathways are often those at highest risk of obesity, diabetes, and cardiovascular disease (Marmot et al., 2020). Embedding these insights within the model and intervention design demonstrates how SP can be aligned with equity-focused approaches to public health. This positions NBSPs not only as individual referral options but as strategic mechanisms for addressing structural inequalities that sustain population-level disease patterns.

Finally, the thesis contributes to policy and systems thinking by positioning the BPS-SP model as a conceptual bridge between community-based practice and national or global NCD strategies. Current policy approaches often promote SP generically, focusing on wellbeing or social connection without specifying behavioural mechanisms or measurable outcomes (Smith et al., 2025). The BPS-SP model and associated tools provide a structured, theory-driven framework that clarifies behavioural targets, identifies measurable biopsychosocial outcomes, and situates SP within preventive health systems. This framework offers policymakers a scalable model for integrating SP into long-term NCD management strategies, thereby reducing reliance on overstretched clinical services and supporting cross-sectoral, life-course approaches to chronic-disease prevention.

Taken together, these contributions move the field forward by demonstrating that NBSPs are more than adjunct wellbeing activities and that SP is more than a peripheral referral option. The BPS-SP provides the conceptual and empirical foundation for a genuinely biopsychosocial, theory-driven, and system-ready intervention. By bridging evidence, theory, practice, and policy, this thesis establishes NBSPs, and SP more broadly, as innovative, equitable, and scalable approaches to reducing the global burden of NCDs.

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Appendices

Appendix A Recruitment Adverts for Social Media (Study 2)

University of Sunderland

SOCIALLY PRESCRIBED ACTIVITIES: : Exploring factors that affect uptake and effectiveness.

PARTICIPANTS NEEDED

Do you want to take part in a study to help us explore the opportunities, barriers, and potential solutions to increasing the uptake and effectiveness of a service and activities that might improve your health and wellbeing?

Seeking participants who:

Are aged 18 or over
Are social prescribers or deliver socially prescribed activities in England

To participate in a focus group either in-person e.g. community venue or via Microsoft Teams (up to 1 hour)

For more information please contact Tina Robson:

Bg51de@student.sunderland.ac.uk

University of Sunderland

SOCIALLY PRESCRIBED ACTIVITIES: : Exploring factors that affect uptake and effectiveness.

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For more information please contact Tina Robson:

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Appendix B Recruitment Email Example (Study 2)

Subject: *Invitation to Participate in Research on SP and Nature-Based Interventions*

Dear [Name],

I am contacting you as part of a postgraduate research project at the University of Sunderland exploring the barriers and opportunities associated with SP, particularly those involving nature-based interventions.

We are inviting professionals who work as either:

- **Social prescribers** (e.g., link workers within primary care settings), or
- **Providers of socially prescribed interventions** (e.g., staff or volunteers in community or voluntary sector organisations)

Your insights will contribute to a qualitative study examining how these services are implemented and experienced in practice.

Participation would involve a focus group (approximately 45–60 minutes) either online or at a local location if feasible.

Eligibility:

- Aged 18 or over
- Currently working in England as a social prescriber or delivering a socially prescribed activity

Participation is voluntary, and you are free to withdraw at any time. All responses will be anonymised, and ethical approval has been granted by the University of Sunderland's ethics committee.

If you are interested in taking part or would like further information, please reply to this email.

Please also feel free to forward this invitation to any colleagues or contacts within your network who may be interested or eligible to participate.

Thank you for considering this invitation. Your professional experience is highly valued and will play an important role in shaping future support for SP.

Warm regards,

Tina Robson
Postgraduate Researcher

University of Sunderland
bg51de@student.sunderland.ac.uk

Appendix C Interview and Focus Group Topic Guides (Study 2)

Interview Questions (Semi-structured)

Topic	Questions
Introduction	• Tell me about yourself • What interested you in participating in this study? • Do you have any health conditions? • How do you feel about your physical and mental health at the moment?
Managing Health and Wellbeing	**Opportunities** • What types of activities, groups or services do you access, or have you previously accessed, to improve your health? • How did you find them? • What helps you improve your health and wellbeing? **Barriers** • What, if anything, makes it difficult for you to improve your health and wellbeing?
SP	**Experiences** • What experiences have you had with SP? (If nothing, I will provide a brief overview of the service) **If some experience:** • What was it like? • How did it benefit you? • How could it have been improved? **If no experience** • How would you feel if you were offered the SP service by your GP? • In what ways might it be helpful for you or others you know? • What might stop you engaging with SP?
Nature-based interventions	**Experiences** • How much time, and in what ways, do you currently spend time in nature? • What experience have you had with nature/green prescriptions? (If nothing, I will provide a brief overview) **If some experience** • Can you describe your experience? • How did it benefit you? • How could it have been improved? • Describe your ideal nature-based activity **If no experience** • How would you feel if you were offered a green prescription? • For what reasons might you not engage in this type of activity? • Describe your ideal nature-based activity

Focus Group Topics (semi-structured)

Topic	Questions
Introduction	• What does your job role, as a social prescriber, involve? • How do you describe SP to users?
SP	**Opportunities?** • Who can benefit from SP? **Barriers** • What barriers stop people accessing SP? • What differences have you seen in the way user groups engage with the service? (Age, gender, health concerns) • In what ways could the service be improved to increase engagement?
SP Interventions	**Opportunities** • What types of activities, services do you signpost to? • What types of activities or services would you recommend for someone with a long-term health condition? • What changes do you expect or hope to see in individuals? **Barriers** • What are some of the challenges when signposting patients to SP activities? • Do you feel like patients know and understand the benefits of SP? • What differences have you seen in the way user groups engage with the various services/activities? (Age, gender, health concerns) • What do you think would help improve engagement with other services/activities?
Nature-based interventions	**Opportunities** • Describe any nature interventions that you offer, or signpost to, as a social prescriber • Who would you recommend a green/nature prescription to? • What changes do you expect or hope to see in individuals? **Barriers** • What barriers, if any, stop people accessing a nature-based activity, group, or service? • Do you feel like patients know and understand the benefits of nature? • What differences have you seen in the way user groups engage with nature activities? (Age, gender, health concerns) • What do you think would help improve engagement with nature activities and services?

Appendix D Participant Information Sheets (Study 2)

University of
Sunderland

Participant Information Sheet

Participant Information Sheet (Interview)

Study Title
Socially prescribed activities: Exploring factors that affect uptake and effectiveness.

What is the study's purpose?

The purpose of this study is to better understand the reasons why individuals may or may not engage with socially prescribed activities, particularly those involving nature.

Socially prescribed activities, particularly those involving nature, have the potential to provide many benefits but it is becoming clear that a better understanding is needed to improve engagement. One of the best methods for this is to enquire about the perceptions of those who have, or could, use socially prescribed activities, as these individuals can provide insights into the opportunities, barriers, and potential solutions to increasing uptake and effectiveness.

Why have I been approached to take part?
You have been approached because you live in England and are over the age of 18.

Do I have to take part?
Participation is voluntary, so you are under no obligation to take part in this study. You have the right to withdraw from the research (without providing a reason). In this case, your data will be destroyed and thus not used in the final analysis.

What will happen to me if I take part?
You will be asked to provide some demographic information including your gender, age, and current health status. You will then be asked to participate in an interview to share your views on socially prescribed activities and how you feel the interventions could affect your health. The interview will be conducted by Tina Robson, a PhD researcher, and your views will aid the development of interventions to help people improve their health.

Where will it take place and for how long?
The interview will take place either at the University of Sunderland, at a convenient place for you, such as your home or place of work, or online via video conferencing. The time taken will be dependent on the interview but will probably be approx. 30 mins – 1 hour.

What are the possible benefits of taking part?

You will be providing valuable opinions which could improve the development of interventions to help people with, or at risk of, long-term health conditions in the future.

What if something goes wrong?
It is not anticipated that anything will go wrong. However, if anything should go wrong, you can exercise your right to withdraw by contacting the researcher. Similarly, if you are unhappy with the conduct of this research, you can contact the research supervisor Dr. Stephanie Wilkie, or the Chair of the University of Sunderland Research Ethics Group Dr. John Fulton. Contact details are included below.

Will my taking part be kept confidential?
Yes. Pseudonyms will be used in the transcripts to protect participant's identities. Upon completion of the interview, only the researcher and supervisors listed on this document will have access to raw data. In accordance with the Data Protection Act 2018, data will be stored on a password protected computer for a minimum of 1 year after the completion of the researcher's PhD, and up to 3 years after any papers associated with this research are accepted for publication. Audio recordings will be deleted as soon as they have been transcribed.

What will happen to the results of the research study?
The result of this study will be written up by the researcher as part of their PhD thesis. If suitable, the results may also be presented at academic conferences and/or written up for publication in peer reviewed academic journals, but data will be anonymized.

Who is organizing and funding the research?
This study is being organized by Tina Robson (PhD student at the University of Sunderland, School of Psychology) and her supervisors. This project has not received external funding.

Who has reviewed this study?
A departmental subcommittee of the University of Sunderland Research Ethics committee has reviewed and approved this study.

Contact for further information
Researcher: Tina Robson
Email: bg51de@student.sunderland.ac.uk

Supervisor 1: Dr. Stephanie Wilkie
Email: stephanie.wilkie@sunderland.ac.uk

Supervisor 2: Dr. Nicola Davinson
Email: nicola.davinson@sunderland.ac.uk

Chairperson of the University of Sunderland Research Ethics Committee:
Dr. John Fulton
Email: john.fulton@sunderland.ac.uk

University of Sunderland

Participant Information Sheet (Focus Group)

Study Title
Socially prescribed activities: Exploring factors that affect uptake and effectiveness.

What is the study's purpose?
The purpose of this study is to better understand the barriers, opportunities, and potential solutions to increasing the uptake and effectiveness of socially prescribed activities, particularly that set-in nature.

Socially prescribed activities, particularly those involving nature, have the potential to provide many benefits but it is becoming clear that a better understanding is needed to improve engagement. One of the best methods for this is to enquire about the perceptions of those who provide and/or deliver such interventions, as these individuals can provide insights into the opportunities, barriers, and potential solutions to increasing uptake and effectiveness.

Why have I been approached to take part?
You have been approached because you are in a position where you can either provide, support, or deliver a socially prescribed activity in England and are over the age of 18.

Do I have to take part?
Participation is voluntary, so you are under no obligation to take part in this study. You have the right to withdraw from the research (without providing a reason). In this case, your data will be destroyed and thus not used in the final analysis.

What will happen to me if I take part?
You will then be asked to participate in a focus group to share your views on SP and how you feel the interventions could affect individual health. The interview will be conducted by Tina Robson, a PhD researcher, and your views will aid the development of interventions to help people improve their health.

Where will it take place and for how long?
The focus group will take place online via video conferencing. The time taken will be approx. 1 hour.

What are the possible benefits of taking part?
You will be providing valuable opinions which could improve the development of interventions to help people with, or at risk of, long-term health conditions in the future.

What if something goes wrong?
It is not anticipated that anything will go wrong. However, if anything should go wrong, you can exercise your right to withdraw by contacting the researcher.

Similarly, if you are unhappy with the conduct of this research, you can contact the research supervisor Dr. Stephanie Wilkie, or the Chair of the University of Sunderland Research Ethics Group Dr. John Fulton. Contact details are included below.

Will my taking part be kept confidential?
Yes. Pseudonyms will be used in the transcripts to protect participant's identities. Upon completion of the interview, only the researcher and supervisors listed on this document will have access to raw data. In accordance with the Data Protection Act 2018, data will be stored on a password protected computer for a minimum of 1 year after the completion of the researcher's PhD, and up to 3 years after any papers associated with this research are accepted for publication. Audio recordings will be deleted as soon as they have been transcribed.

What will happen to the results of the research study?
The result of this study will be written up by the researcher as part of their PhD thesis. If suitable, the results may also be presented at academic conferences and/or written up for publication in peer reviewed academic journals, but data will be anonymized.

Who is organizing and funding the research?
This study is being organized by Tina Robson (PhD student at the University of Sunderland, School of Psychology) and her supervisors. This project has not received external funding.

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Contact for further information.
Researcher: Tina Robson
Email: bg51de@student.sunderland.ac.uk

Supervisor 1: Dr. Stephanie Wilkie
Email: stephanie.wilkie@sunderland.ac.uk

Supervisor 2: Dr. Nicola Davinson
Email: nicola.davinson@sunderland.ac.uk

Chairperson of the University of Sunderland Research Ethics Committee:
Dr. John Fulton
Email: john.fulton@sunderland.ac.uk

Appendix E Service User Consent Forms (Study 2)

University of Sunderland

Participation Consent Form

Study title: Investigating biopsychosocial impacts of nature based social prescriptions on health behaviours of individuals with, or at risk of developing, long-term health conditions.

Please tick the following boxes to indicate your consent to each statement.

I confirm that I have read and understood the information sheet for the above study and have had the opportunity to ask questions. ☐

I understand that my participation is voluntary and that I am free to withdraw, without reason, at any time by emailing the researcher. (see information sheet) ☐

I agree to the interview/focus group being audio recorded. ☐

I understand that anonymised quotations from interview transcripts may be used in reports and other outputs from this research. ☐

I agree to take part in the above study. ☐

By signing this for you confirm that you are:

- Over the age of 18
- Registered with a GP within the Northeast of England

Participant	Date	Signature
Researcher	Date	Signature

SP or Facilitator Consent Form – Study 2

University of
Sunderland

Participation Consent Form

Study title: Socially prescribed activities: Exploring factors that affect uptake and effectiveness.

Please tick the following boxes to indicate your consent to each statement.

I confirm that I have read and understood the information sheet for the above study and have had the opportunity to ask questions. ☐

I understand that my participation is voluntary and that I am free to withdraw, without reason, at any time by emailing the researcher. (see information sheet) ☐

I agree to the interview/focus group being audio recorded. ☐

I understand that anonymised quotations from interview transcripts may be used in reports and other outputs from this research. ☐

I agree to take part in the above study. ☐

By signing this for you confirm that you are:

- Over the age of 18
- Are a social prescriber or able to provide or deliver socially prescribed activities within your organisation

Participant	Date	Signature
Researcher	Date	Signature

Appendix F Participant Questionnaire (Study 2)

Name:

Gender:

Male Female Other (Please specify) Prefer not to say

Age:

18-24 25-34 35-44 45-54 55-64 65-74 75-84 85+

Ethnicity:

- Asian or Asian British (Indian/Pakistani/Bangladeshi/Chinese/Other)
- Black, African, Caribbean or Black British
- Mixed or Multiple ethnic groups (White and Black Caribbean/White and Black African/White and Asian/Any other Mixed or Multiple ethnic background)
- White (English /Welsh/Scottish/Northern Irish/Irish /British/Gypsy or Irish Traveller/Any other White background)
- Other ethnic group (Arab/Any other ethnic group)
- Prefer not to say

Do you consider yourself to have a disability or health condition?

Yes No Prefer not to say

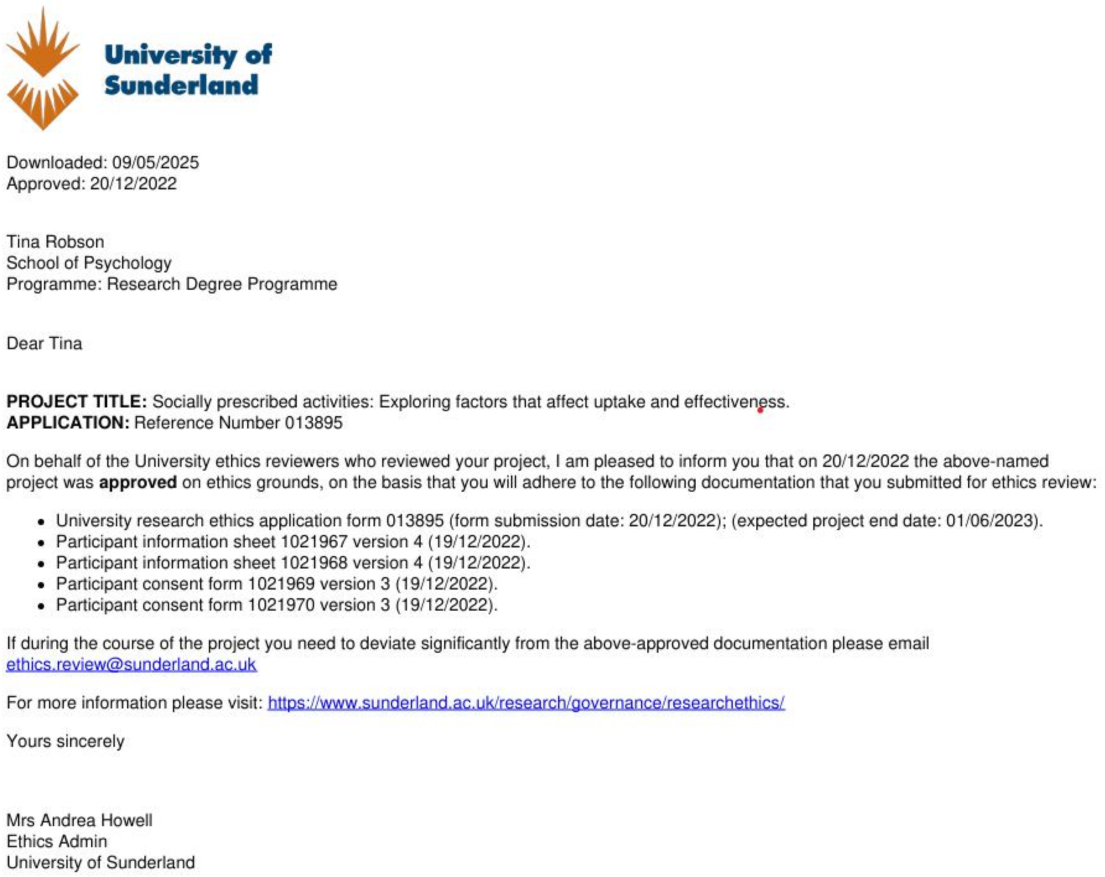
How would you describe your health?

Very poor Poor Fair Good Excellent

Would you consider yourself to be 'at risk' of developing health complications?

Yes No Maybe

Appendix G Ethics Approval Letter (Study 2)



University of
Sunderland

Downloaded: 09/05/2025
Approved: 20/12/2022

Tina Robson
School of Psychology
Programme: Research Degree Programme

Dear Tina

PROJECT TITLE: Socially prescribed activities: Exploring factors that affect uptake and effectiveness.
APPLICATION: Reference Number 013895

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 20/12/2022 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 013895 (form submission date: 20/12/2022); (expected project end date: 01/06/2023).
- Participant information sheet 1021967 version 4 (19/12/2022).
- Participant information sheet 1021968 version 4 (19/12/2022).
- Participant consent form 1021969 version 3 (19/12/2022).
- Participant consent form 1021970 version 3 (19/12/2022).

If during the course of the project you need to deviate significantly from the above-approved documentation please email ethics.review@sunderland.ac.uk

For more information please visit: https://www.sunderland.ac.uk/research/governance/researchethics/

Yours sincerely

Mrs Andrea Howell
Ethics Admin
University of Sunderland

Appendix H Recruitment Social Media Advert (Study 3)

University of Sunderland

GREEN PRESCRIBING INTERVENTION TO INCREASE ENGAGEMENT:
A QUALITATIVE FEASIBILITY AND ACCEPTABILITY STUDY.

PARTICIPANTS NEEDED

Do you want to take part in a study to provide feedback and ideas to develop interventions which help increase the uptake of nature based interventions?

Seeking participants who:

Are aged 18 or over
Live in England and speak fluent English

For a Focus Group of up to 1 hour (Microsoft Teams)

For more information please contact Tina Robson:

Bg51de@student.sunderland.ac.uk

Appendix I Focus Group Plan & Topic Guide (Study 3)

Findings from previous research – Interviews and focus groups.

- Resources and training (Time to spend in nature/Weather and accessibility/Transport/*Staffing and training/Expectations & Capacity/Funding*)
- Communication and knowledge (SP not common knowledge/don't know what is available or how to access/*keep up to date with local services and activities/Inappropriate referrals*)
- Developing Trust (Knowledge/Confidence/Permission)
- Experience (Sense of purpose/Disconnecting/Social Interaction)
- Outcomes (Funding outcomes/expected benefits)

Intervention recommendations and the reasons for them.

- Information Video – To raise awareness of the benefits and opportunities available to motivate people to spend time in nature.
- Information on local green spaces and activities (Interactive map/leaflets) to increase knowledge and awareness
- Nature Needs Assessment and Interactive Map – Questionnaire to help in deciding best option for you and what to do next to reduce impact on SP and help people decide what is best for them. Interactive Map to show where and how to access green space and activities.
- Tool to measure progress and outcomes – To monitor and report on the effectiveness of the interventions to ensure positive impact for both the individual and the service.
- Community Forum – To share, discuss and update stakeholders.

The following questions will be used to guide the discussion:

Video

- What would you like to see in the video?
- How can the video be designed to be memorable and impactful?
- What key messages should be highlighted?
- Who would you like to see in the video?
- How long should the video be?
- How could the video be shared?
- Is there anything that would stop you watching the video?
- How can we measure the impact of the video?

Nature Needs Assessment Tool with Interactive Map

- What are your initial thoughts on having a NNA tool that could help you understand your preferences and overcome barriers to engaging in nature?
- How do you think it could help?
- What types of questions or topics should be included to make it useful? (location, activity type, physical ability, social or solo)
- Would you prefer a structured prescription i.e. specific activity or area and goal (this specific activity for this specific amount of time) or a more flexible suggestion. For example. Someone who is socially anxious with mobility problems who has a small garden might be prescribed '10 minutes per day spent in the garden or looking out of the window)
- How would you want to complete the NNA? (Online, paper, verbally)
- What would you like to see on the interactive map of your local area?
- Are there any aspects that might discourage you from using the NNA or map?

- What additional support or follow up would make the tool more beneficial?

Measuring and reporting outcomes

- What are your thoughts with regards to having a standard tool/worksheet that is used to monitor participant progress?
- How can we ensure the tool/worksheet is user-friendly?
- How can we ensure that data collection is inclusive and representative of all participants?
- How often should it be reviewed?
- How can we encourage consistent and accurate data reporting?
- How long should it take to complete?
- How could the data/information be collected? (online, app, face to face appointment)
- How can we ensure confidentiality and data security?

Community Forum

- What are your thoughts regarding a regular forum for social prescribers, VCS representative and participants to discuss and update on activities?
- What forum would be most effective? (virtual, in-person, written)
- How often might these be useful?
- Who could be involved?
- What should the key topics or focus areas be for regular discussions or forums?
- What barriers can you foresee, if any?

The recommendations as a whole

- What are your thoughts on the recommendations as a whole?
- How can you see it working in your local area?
- How effective do you think they will be in increasing uptake and engagement?
- How can we ensure that these recommendations reach and appeal to those who need them most?
- What local resources or partnerships could help implement these recommendations successfully?
- What concerns or obstacles do you think might arise when putting these recommendations into practice?

Appendix J Participant Information Sheet (Study 3)

University of
Sunderland

Participant Information Sheet

Study Title: Green prescribing intervention to increase engagement: A qualitative feasibility and acceptability study.

What is the study's purpose?

The purpose of this study is to gather feedback regarding recommended interventions, from those who can provide, promote, deliver and potentially attend them, to help increase the uptake of nature-based activities.

The main aim of this study is to expand on phase 1 of the study which explored the opportunities, barriers, and potential solutions to increasing uptake and effectiveness of activities which take place in nature. Phase one involved consulting with those who can provide, promote, and deliver non-medical, community or social activities within nature, as well as those who might benefit from them.

The findings from the 1st phase suggest a number of factors which impact on uptake such as, lack of knowledge, low self-efficacy, outcome expectations and attitudes and beliefs, therefore interventions to overcome these have been developed. This next phase aims to gather feedback regarding these potential interventions, from those who can provide, promote, deliver and potentially attend them, to assess and develop their feasibility and effectiveness in helping to increase the uptake of nature-based interventions.

Why have I been approached to take part?

You have been approached because you are in a position where you can either provide, support, or deliver a socially prescribed activity in England and are over the age of 18.

Do I have to take part?

Participation is voluntary, so you are under no obligation to take part in this study. You have the right to withdraw from the research (without providing a reason). In this case, your data will be destroyed and thus not used in the final analysis.

What will happen to me if I take part?

You will be asked to participate in a focus group to share your views on the recommended intervention design. The focus group will be facilitated by Tina Robson, a PhD researcher, and your views will aid the development of interventions to help people improve their health.

Where will it take place and for how long?

The focus group will take place online via video conferencing. The time taken will be approx. 1 hour.

What are the possible benefits of taking part?
You will be providing valuable opinions which could improve the development of interventions to help people with, or at risk of, long term health conditions in the future.

What if something goes wrong?
It is not anticipated that anything will go wrong. However, if anything should go wrong, you can exercise your right to withdraw by contacting the researcher. Similarly, if you are unhappy with the conduct of this research, you can contact the research supervisor Dr. Stephanie Wilkie, or the Chair of the University of Sunderland Research Ethics Group Dr. John Fulton. Contact details are included below.

Will my taking part be kept confidential?
Yes. Pseudonyms will be used in the transcripts to protect participant's identities. Upon completion of the interview, only the researcher and supervisors listed on this document will have access to raw data. In accordance with the Data Protection Act 2018, data will be stored on a password protected computer for a minimum of 1 year after the completion of the researcher's PhD, and up to 3 years after any papers associated with this research are accepted for publication. Audio recordings will be deleted as soon as they have been transcribed.

What will happen to the results of the research study?
The result of this study will be written up by the researcher as part of their PhD thesis. If suitable, the results may also be presented at academic conferences and/or written up for publication in peer reviewed academic journals, but data will be anonymized.

Who is organizing and funding the research?
This study is being organized by Tina Robson (PhD student at the University of Sunderland, School of Psychology) and her supervisors. This project has not received external funding.

Who has reviewed this study?
A departmental subcommittee of the University of Sunderland Research Ethics committee has reviewed and approved this study.

Contact for further information.
Researcher: Tina Robson
Email: bg51de@student.sunderland.ac.uk

Supervisor 1: Dr. Stephanie Wilkie
Email: stephanie.wilkie@sunderland.ac.uk

Supervisor 2: Dr. Nicola Davinson
Email: nicola.davinson@sunderland.ac.uk

Chairperson of the University of Sunderland Research Ethics Committee:
Professor Matthew Campbell
Email: matthew.campbell@sunderland.ac.uk

Appendix K – Participant Consent Form (Study 3)

University of
Sunderland

Participation Consent Form

Study title: Green prescribing intervention to increase engagement: A qualitative feasibility and acceptability study.

Participant Code: ____________________
Please initial here

Please tick the following boxes to indicate your consent to each statement.

I confirm that I have read and understood the information sheet for the above study and have had the opportunity to ask questions. ☐

I understand that my participation is voluntary and that I am free to withdraw, without reason, at any time by emailing the researcher. (see information sheet) ☐

I agree to the focus group being audio recorded. ☐

I understand that anonymised quotations from interview transcripts may be used in reports and other outputs from this research. ☐

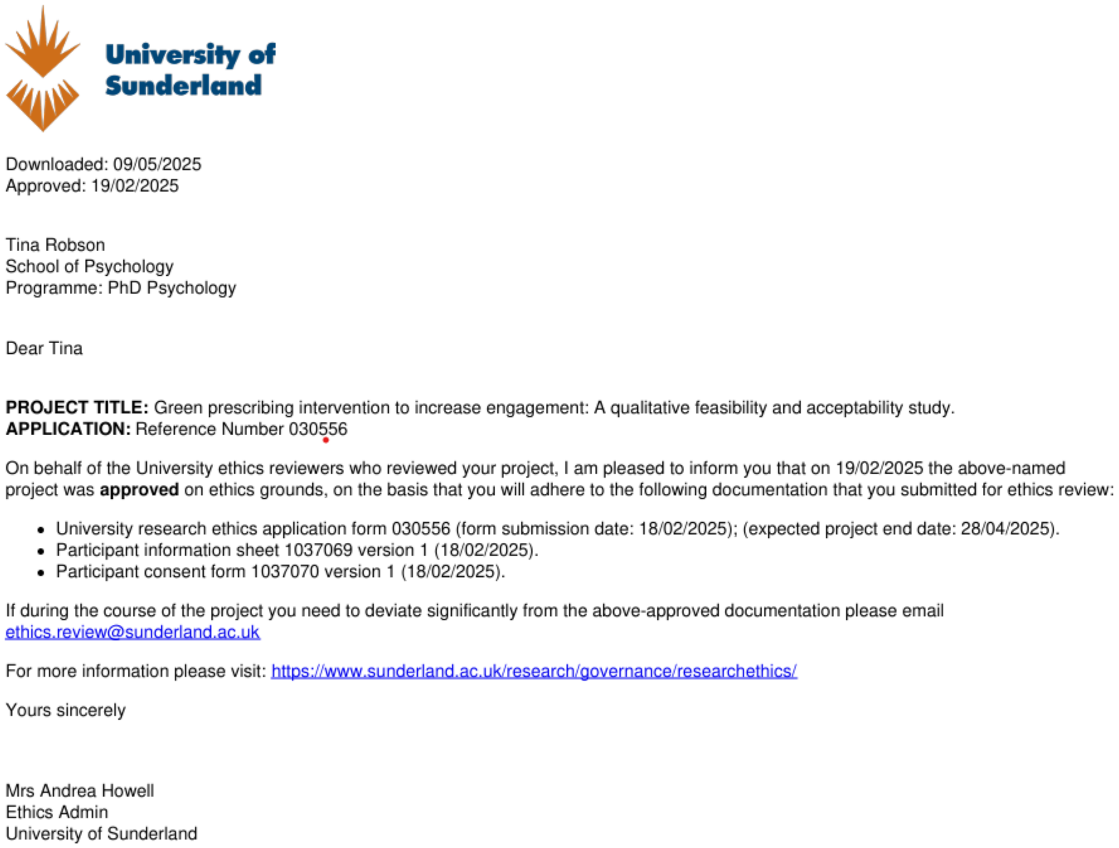
I agree to take part in the above study. ☐

By signing this for you confirm that you are:

- Over the age of 18

____________________	__________	______________
Participant	Date	Signature
____________________	__________	______________
Researcher	Date	Signature

Appendix L Ethics Approval Letter (Study 3)



University of
Sunderland

Downloaded: 09/05/2025
Approved: 19/02/2025

Tina Robson
School of Psychology
Programme: PhD Psychology

Dear Tina

PROJECT TITLE: Green prescribing intervention to increase engagement: A qualitative feasibility and acceptability study.
APPLICATION: Reference Number 030556

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 19/02/2025 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 030556 (form submission date: 18/02/2025); (expected project end date: 28/04/2025).
- Participant information sheet 1037069 version 1 (18/02/2025).
- Participant consent form 1037070 version 1 (18/02/2025).

If during the course of the project you need to deviate significantly from the above-approved documentation please email ethics.review@sunderland.ac.uk

For more information please visit: https://www.sunderland.ac.uk/research/governance/researchethics/

Yours sincerely

Mrs Andrea Howell
Ethics Admin
University of Sunderland

Table A 1

AMSTAR 2 Ratings of Included Reviews

Study	Overall AMSTAR 2 Rating	Notes
Arsenijevic & Groot (2017)	Moderate	Well-structured review, lacked protocol and dual selection.
Bickerdike et al. (2017)	Low	Registered, but no meta-analysis and minimal bias discussion.
Bock et al. (2014)	Moderate	Good meta methods and bias tools; missing funding sources.
Chatterjee et al. (2017)	Low	Systematised, not formal SR; lacked bias assessment.
Chen et al. (2024)	Moderate	Good quality synthesis; heterogeneity limited pooling.
Hanson & Jones (2015)	High	Rigorous methods and comprehensive synthesis.

Study	Overall AMSTAR 2 Rating	Notes
Patil et al. (2018)	High	Strong meta-analysis and bias control; no funding info.
Pavey et al. (2011)	High	High-quality methods, clear interpretation and synthesis.
Pescheney et al. (2019)	Moderate	Good protocol and synthesis; lacked pooled effect stats.
Struthers et al. (2024)	High	Thorough design and subgroup reporting, some bias present.
Williams et al. (2007)	Moderate	Comprehensive but older review, no bias or publication bias checks.
Nowrin et al. (2023)	Moderate	Moderate confidence: protocol registered, narrative synthesis only.

Table A 2

Initial Codes and Theme Development (Study 2)

Initial Codes	Final Theme
Lack of time due to work or caregiving	Resources
Limited access to transport	Resources
Unsuitable weather or terrain	Resources
Inconvenient scheduling of activities	Resources
Cost of suitable clothing or equipment	Resources
Inadequate training to support mental health	Staffing and Training
Referral mismatch with user needs	Staffing and Training
Lack of staff to support initial engagement	Staffing and Training
Unclear boundaries of organisational capacity	Staffing and Training
Fear of judgement in group settings	Developing Trust
Low confidence or social anxiety	Developing Trust
Need for prior familiarity with facilitator	Developing Trust
Feeling guilty about prioritising self-care	Developing Trust
Professional recommendation gives legitimacy	Experience
Desire for purposeful activity	Experience
Value of disconnecting from modern life	Experience
Social interaction with peers seen as beneficial	Experience
Long waiting times for referrals	Expectations and Capacity
Inconsistent outcome measurement	Expectations and Capacity
Variation in expectations across roles	Expectations and Capacity

Table A 3

Themes, Sub-themes, and Illustrative Quotes from Study 2 (Qualitative Needs Assessment)

Theme	Sub-theme	Illustrative Quote
Resources	Time constraints and competing demands	"Even finding time to go to the GP… I just don't have time." (U04)
Resources	Environmental challenges: weather, terrain, and physical limitations	"If it was torrential rain or hailstone, I would struggle to see how that would make me feel healthier or happier." (U09)
Resources	Transport and accessibility barriers	"We have one guy that comes… if he misses the bus then he actually walks 3–4 miles to get to us." (A01)
Staffing and Training	Emotional demands on facilitators	"They will come along and then you can see they're so anxious… but we just don't have the skills to know how to deal with that." (A02)
Staffing and Training	Mismatched expectations and capacity	"It caused us immense stress to the point where now we debate whether to even continue." (A01)
Developing Trust	Knowledge and familiarity	"I think I would overanalyse all of it before I agree… I'd probably still need someone." (U06)
Developing Trust	Confidence and self-belief	"I was quite taken aback that I could actually do golf… that's maybe what kept me going." (U03)
Developing Trust	Permission and legitimacy	"I think if my GP suggested it, I'd take it more seriously." (U05)
Value of the Experience	Enjoyment and meaning	"It gave me purpose, something to get up for." (U08)

Theme	Sub-theme	Illustrative Quote
Value of the Experience	Connection to nature	“Being outdoors makes me feel calmer and more positive.” (U02)
Expectations and Capacity	Service delivery pressures	“Timing is always one of the sticking points.” (I02)
Expectations and Capacity	Balancing user needs with resources	“We’d love to offer more flexible times, but we just don’t have the staff.” (Adopter, A03)
Perceived Outcomes and Change	Psychological and social outcomes	“It made me less anxious, more willing to try new things.” (U11)
Perceived Outcomes and Change	Behavioural changes	“I walk more now because of the group, I wouldn’t have done that on my own.” (U07)

Table A 4

Initial Codes and Theme Development (Study 3)

Initial Codes	Final Theme
Lack of time for implementers to "handhold" users	Practical barriers and challenges
Patients needing to self-motivate to access services	Practical barriers and challenges
Staff capacity limits ability to offer support	Practical barriers and challenges
Digital exclusion: not everyone has smartphones	Practical barriers and challenges
Not all patients can access online links	Practical barriers and challenges
Suggestion to use GP surgery information screens	Practical barriers and challenges
Concern about long-term maintenance of videos/maps	Sustainability
Fear that digital tools will become outdated	Sustainability
Worry about responsibility for updating resources	Sustainability
Lack of plans for sustainable funding or staffing	Sustainability
Mass/bulk communication seen as easier for surgeries	Organisational Support
Lack of directive for outcome measurement in PCNs	Organisational Support
Resistance to additional workload without funding	Organisational Support
Scaling interventions seen as key to adoption	Organisational Support
Practices unlikely to adopt unless easy/systematic	Organisational Support
Intervention gives psychological "light at the end of the tunnel"	Perceived relevance and value
Nature engagement seen as improving mental health	Perceived relevance and value
Healthcare professionals finding interventions streamline referrals	Perceived relevance and value
Clear tools make conversations with patients easier	Perceived relevance and value

Initial Codes	**Final Theme**
Videos need to be short to maintain attention	Engagement and motivation
Long videos risk people "zoning out"	Engagement and motivation
Content should feel local and relatable	Engagement and motivation
Generic or irrelevant content reduces engagement	Engagement and motivation
Personal connection to activities increases motivation	Engagement and motivation
Personalised advice (e.g., from NHS) builds trust	Personalisation
Participants overwhelmed by too many choices	Personalisation
Patients act more when given simple recommendations	Personalisation
Vulnerable individuals prefer structured support	Personalisation
Nature needs assessment could guide better choices	Personalisation

Table A 5

Themes, Sub-themes, and Illustrative Quotes from Study 3 (Feasibility and Acceptability Study)

Theme	Sub-theme	Illustrative Quote
Practical barriers and challenges	Digital exclusion	"Not everyone has smartphones… you'd lose people straight away." (Adopter, A03)
Practical barriers and challenges	Staff capacity limits	"We don't always have the time to handhold people through another tool." (Implementer, I01)
Practical barriers and challenges	Patient self-motivation	"It only works if I can motivate myself to actually go." (Service user, U03)
Sustainability	Concerns about updating tools	"Videos and maps are great, but who's going to keep them up to date?" (Adopter, A02)
Sustainability	Funding	"Without long-term funding, it'll just fizzle out like other projects." (Implementer, I02)
Organisational support	Fit with existing systems	"People are more likely to take it seriously if it's part of onboarding or if it's got the NHS logo on it, it's about trust and time." (Implementer, I01)
Organisational support	Workload concerns	"Another form to fill in would put people off unless it was simple." (Implementer, I02)
Organisational support	Scaling across practices	"Unless it's easy to roll out systematically, most surgeries won't touch it." (Adopter, A01)
Perceived relevance and value	Psychological impact	"Something like what you're suggesting… it gives you a little bit of a

Theme	Sub-theme	Illustrative Quote
		light at the end of the tunnel because you're thinking to yourself, I'm going to do this, I'm going to get out into nature." (Service user, U01)
Perceived relevance and value	Mental health benefits	"Being outdoors just makes me feel calmer and more positive." (Service user, U02)
Perceived relevance and value	Streamlined referrals	"Our job is made so much easier if we've got all those services and opportunities available." (Implementer, I02)
Engagement and motivation	Encouragement from practitioners	"If my GP suggested it, I'd take it more seriously." (Service user, U05)
Engagement and motivation	Social connectedness	"It felt good to meet others in the group who understood." (Service user, U07)
Personalisation	Relevance to local opportunities	"If it randomly showed the beach or whatever… I think, that doesn't really apply to me because I'm not going to drive an hour to do that." (Service user, U04)
Personalisation	Tailoring to needs	"It was helpful to feel guided and validated… especially if it came from the NHS." (Service user, U06)

Note. Themes and quotes are drawn from Study 3 focus groups and interviews exploring feasibility and acceptability of proposed intervention components.