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Greenspace programmes for mental health: A survey study to test what works, for whom, and in what circumstances

Wendy Masterton [a,*], Kirsty Park [b], Hannah Carver [a], Tessa Parkes [a]

[a] Salvation Army Centre for Addiction Services and Research, Faculty of Social Sciences, University of Stirling, Stirling, FK9 4LA, Scotland, UK
[b] Biological and Environmental Sciences, University of Stirling, Stirling, FK9 4LA, Scotland, UK

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ABSTRACT

The health benefits of greenspace are widely acknowledged. Greenspace programmes, defined as health programmes undertaken in outside green areas such as parks, gardens, hills, and forests, are becoming more commonplace. However, there is still limited understanding of the mechanisms by which greenspace programmes are effective. This makes future development and implementation very difficult. We recently developed and published a novel framework for greenspace programmes for mental health showing what works, for whom, and in what circumstances (Masterton et al., 2020). In this current study, the accuracy of the proposed framework was tested for the first time using primary data from greenspace organisations in Scotland. Given the link between mental health and substance use, the applicability of the framework to programmes that support people with problem substance use was also tested. A survey was designed to test the contexts, mechanisms, and outcomes identified within the previously proposed framework. The survey was completed by 64 participants to provide a general overview of the framework's applicability for programmes that support mental health, as well as for programmes that support people with problem substance use. Overall, respondents agreed with all survey statements. This suggests that the framework does effectively represent the underlying context, mechanism, outcome configurations of greenspace programmes for mental health. Furthermore, there were no differences between responses from organisations that support people with problem substance use, and organisations that do not support this client group. This shows that the framework has the potential to be applicable to both greenspace programmes for mental health and greenspace programmes for people with problem substance use. This is a novel finding as, to our knowledge, there is currently no framework looking to explain the contexts, mechanisms, and outcomes necessary for greenspace programmes to be successful for people with problem substance use.

1. Background

A growing body of evidence suggests that spending more time in nature results in improved health outcomes (Hartig et al., 2014; Twohig-Bennett & Jones, 2018). From a public health perspective, 'greenspace' can be defined and characterised by its ability to provide healing and positive physical and mental health outcomes (Haubenhofer et al., 2010). Living in areas with a higher number of green spaces, such as parks, gardens, and woodlands, for example, has been linked to lower risk of non-communicable diseases such as cardiovascular disease (Kardan et al., 2015), obesity (Halonen et al., 2014), and diabetes (Astell-Burt et al., 2014), as well as lower levels of overall mortality (Pearce et al., 2016; Gascon et al., 2016). As well as physical health, greenspace is linked to positive mental health (Barton & Pretty, 2010; Callaghan et al., 2020; Hartig et al., 2014; Hartig & Kahn, 2016; Hystad et al., 2019). The term 'mental health' is used to describe the state of a person's psychological wellbeing ranging from positive mental health to poorer mental health, with the latter often being referred to as mental health problems (Pilgrim, 2017). Greenspace is increasingly being used both recreationally by individuals, as well as in a more structured way by organisations, to achieve positive mental health outcomes, such as reductions in stress or improvements in mood, in a variety of settings from public parks and woodlands to gardens in hospitals and care homes (Frumkin, 2013; Robinson et al., 2020). In a recent study by White et al.

* Corresponding author.
E-mail addresses: wendy.masterton@stir.ac.uk (W. Masterton), k.j.park@stir.ac.uk (K. Park), hannah.carver@stir.ac.uk (H. Carver), t.s.parkes@stir.ac.uk (T. Parkes).

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(2019), data collected from 19,806 people in England showed that those who spent 2 h in nature per week had consistently better health and wellbeing. While the direction of effect is difficult to determine, the results of this large-scale study strongly support the link between time spent in greenspace and mental health.

With the rising awareness of the association between greenspace and mental health, there are now many health programmes where greenspace plays an integral part (Lovell et al., 2015). Various programmes exist, often incorporating a number of activities defined as 'green care' including gardening or horticultural programmes; organised walks for wellbeing; forest walks and forest bathing; wilderness programmes; outdoor woodland learning; adventure programmes; nature-based mindfulness; conservation activities, and care farming (Barton et al., 2016; Haubenhofer et al., 2010; Jepson et al., 2010; Robinson et al., 2020). As well as specific physical and mental health outcomes, intended outcomes of greenspace programmes can also include supporting biodiversity (Goddard et al., 2010), increasing connectedness to nature (Liefländer et al., 2013), learning new skills (Adevi & Lieberg, 2012), and increasing social cohesion (Jennings & Bamkole, 2019).

Previous systematic reviews and meta-analyses of greenspace programmes for mental health have provided evidence of their effectiveness (Bowen & Neill, 2013; Cipriani et al., 2017; Genter et al., 2015; Gorman & Cacciatore, 2017). However, while there is general agreement that greenspace programmes are associated with positive outcomes, concern has been raised over the robustness of study designs and therefore the quality of the existing evidence (Husk et al., 2016). Greenspace may have a positive effect on mental health, but from current evidence, it is not clear how greenspace programmes work, and what mechanisms of change lead to the desired outcomes (Husk et al., 2016; Norton et al., 2014). Without knowing the necessary components, processes, and influences needed for the programmes to work, it is impossible to understand why the programmes work and how best to replicate them.

1.1. Previous research: international evidence for greenspace programmes for mental health

Previous reviews (Husk et al., 2016; Lovell et al., 2015) have produced conceptual models of the mechanisms by which engagement with nature impacts physical and mental health. However, different contexts are likely to facilitate different mechanisms and outcomes meaning what 'works' in one programme might not 'work' in another. To address this gap, we recently conducted a realist review to synthesise the international evidence for greenspace programmes for mental health in both clinical and non-clinical populations (Masterton et al., 2020). The aim was to explore how greenspace programmes work, why they work, for whom, how context influences mechanisms of change, and how mechanisms of change lead to outcomes. Causation is central to a realist approach; the premise is that the outcomes of a complex intervention programme, such as changes in behaviour, are directly caused by underlying generative mechanisms, described as the invisible elements of reasoning and reaction, such as thoughts and emotions, which have been activated in the right contexts (Pawson & Tilley, 1997). Contexts can be wide ranging, for example individual, interpersonal, organisational, or institutional factors (Pawson & Tilley, 1997). This causal relationship between contexts, mechanisms, and outcomes is referred to as the context-mechanism-outcome configuration (CMOc), and these CMOcs are described as the 'programme theories' of why a programme works. Each programme will consist of a number of programme theories which will be tested and refined. Realist methodology is becoming an increasingly popular way to synthesise complex public health intervention programmes as it allows an in-depth theoretical understanding of programmes (Wong et al., 2010). Greenspace programmes are examples of complex intervention programmes because there is substantial diversity in the contexts in which they run. For example, the environment is often uncontrolled and in different settings, there are typically multidisciplinary teams involved, there are often many different activities, and there are often different policy and funding landscapes across programmes. Further, the mechanisms that are activated, such as different emotional responses, will differ across programme participants, and the programme outcomes can be wide-ranging.

Through an in-depth synthesis of the existing international literature, seven programme theories were developed to show how greenspace programmes work under three themes of Nature, Individual Self, and Social Self (Masterton et al., 2020). The titles of the seven programme theories were: The Feeling of Escape and Getting Away; Having Space to Reflect; Physical Activity; Self-Efficacy; Having a Purpose; Relationships with Facilitators; and Shared Social Experiences. A number of contexts, mechanisms, and outcomes were included in each programme theory, and we proposed that the titles best described the core concept of each programme theory. The programme theories allowed an understanding of greenspace programmes in general and helped explain how optimum mental health outcomes, such as decreased stress, improved mood and self-esteem, and improved social cohesion, among others, could be achieved. Further, all programmes included in our review (Masterton et al., 2020) ranged from urban projects, such as garden programmes, to rural based projects, such as wilderness programmes. We suggested that it did not appear to matter what the mode of delivery was, nor where the programme was located, the contexts, mechanisms, and outcomes were still the same across programmes. However, developing a framework using realist methodology is an iterative process and programme theories are potentially changeable depending on the programme. Therefore, in this current exploratory study, the proposed framework in our review (Masterton et al., 2020) was tested for the first time using primary data to establish whether the developed programme theories that informed the framework took into account the nuances across existing greenspace programmes, and whether the framework was actually applicable across all settings. This testing is necessary as it is currently unclear if mechanisms and outcomes within the proposed programme theories (Masterton et al., 2020), such as the feeling of escape and having space to reflect, which seem to suggest the need for larger expanses of greenspace, would indeed be as applicable to urban programme settings compared to rural programme settings.

1.2. Greenspace programmes for problem substance use

As well as identifying how greenspace can improve mental health, we were interested in exploring how greenspace programmes may potentially support people with problem substance use. Problem substance use is defined as a pattern of harmful use of any substance such as alcohol and other drugs (illegal or not). The use of these substances often places a person at a higher risk of health, psychological, or social problems (EMCDDA, 2020). We propose that it is feasible to explore both mental health and problem substance use together, given that previous systematic reviews and meta-analyses have reported a strong association between the two (Hunt et al., 2016; Kingston et al., 2017; Lai et al., 2015). In some instances, the use of drugs or alcohol may be a way of trying to reduce or cope with existing symptoms of poor mental health or used as coping strategies to manage stressful life events (McVicar et al., 2015). However, the use of drugs or alcohol can also lead to poorer mental health (Adrian & Barry, 2003; Green et al., 2017; McKetin et al., 2019). Given the association, if greenspace programmes are shown to be successful in improving mental health, then this improvement could feasibly affect a person's substance use.

Previous research within the field of substance use has shown that mechanisms such as increasing feelings of empowerment and improving relationships are core components of successful substance use interventions (Mincin, 2018; Pettersen et al., 2019). If these mechanisms are also evident within greenspace programmes, again this suggests that these types of programmes could be effective in supporting people with problem substance use. However, there is currently very little existing evidence to inform how greenspace programmes that support people with problem substance use might be developed. By testing the

framework using data from greenspace programmes that report support for this client group, we explored to what extent the framework could work for problem substance use support, as well as to improve mental health. If the framework is applicable to programmes that support people with problem substance use, we propose that this is an important gap to address, because building on existing knowledge and assessing the potential for transferable programme theories may be more timely and pragmatic than attempting to develop an entirely new framework. In particular, testing the framework for use with a specific client group will provide valuable detail about 'for whom' a programme works and why, key questions in realist research.

1.3. Empirical focus of Scotland

To enable us to test the framework proposed in our previous review (Masterton et al., 2020), we chose to focus on existing greenspace programmes in Scotland. The framework was informed by data from nine countries suggesting that it was internationally relevant, however testing of the programme theories in a specific geographical context allowed us to explore this. If the framework is internationally relevant, then it should be applicable to greenspace programmes in any chosen country. The range of Scotland's greenspace is highlighted by the Scottish Government's *Planning Advice Note for Planning and Open Space* (2008), where 11 separate classifications of greenspace were identified under the open space heading, showing that terms such as public parks and gardens, amenity greenspace, play space, sports areas, green corridors, undeveloped land, and allotments might be used instead of the term 'greenspace'. Further, with the role of greenspace growing in health improvement discourse, the number of greenspace programmes for mental wellbeing is also increasing (Edinburgh & Lothians Health Foundation, 2019). Due to the variety of greenspace settings, and growing number of programmes, gathering data from Scotland allowed us to test the framework using a range of programmes such as urban garden programmes, horticultural programmes, conservation programmes, and wilderness programmes, among others. This was particularly important in order to test our claim that the framework is applicable to greenspace programmes regardless of activity and setting.

1.4. Study aim

The first aim of this exploratory study was to test the accuracy of our proposed framework (Masterton et al., 2020) by collecting primary data from staff on greenspace programmes in Scotland. A claim in our review was that the framework should be transferable to all greenspace programmes. If the framework was indeed transferable to all programme types and settings, we would expect to see overall agreement for all programme theories from all staff, regardless of programme setting. Our second aim was to test the potential applicability of the framework to greenspace programmes for people with problem substance use.

1.5. Research questions

1. What greenspace programmes exist in Scotland, what client groups do the programmes support, and where?
2. Does the existing framework in Masterton et al. (2020) adequately represent the underlying context, mechanism, outcome configurations of greenspace programmes for mental health, when tested with data from existing greenspace programmes?
3. Is there overall agreement with the framework from staff on across different settings of greenspace programmes, from urban greenspace programmes to rural-based programmes?
4. Does the framework have the potential to be applicable to greenspace programmes for people with problem substance use?

2. Methods

2.1. Survey rationale and design

Realist approaches use multiple methods to gain insight into programme theory, therefore a survey approach was considered to be an appropriate method for an exploratory study. The rationale of using a survey was that it enabled the collection of data relatively quickly from a mix of people based in different geographical areas which was important in order to test the applicability of the framework across diverse contexts in Scotland. Using a survey also allowed statistical testing and comparison between different groups to explore the relevance of the framework for use on greenspace programmes that support people with problem substance use. The survey was designed using the JISC online survey tool (https://www.onlinesurveys.ac.uk/) by the lead researcher (WM) and ran between 28th January 2020 and 27th May 2020. As the COVID-19 pandemic began during our data collection phase, the use of a survey allowed us to continue data collection from a mix of people despite travel restrictions. The survey had 67 items in total which were split into three main sections: organisation information, greenspace programme information, and programme components (see Appendix 1 for the full survey document).

2.1.1. Section A: organisation information

In this section we asked the name of organisation, whether the organisation was public, private, or third sector, and which town or city the organisation was based in.

2.1.2. Section B1: greenspace programme information

To gather data about programme characteristics we asked six questions on the name of the programme, whether the programme supported mental wellbeing, whether the programme supported people with problem alcohol use and/or problem illicit drug use, what age groups could access the programme, and were there exclusion criteria for clients attending programmes.

2.1.3. Section B2: greenspace programme information

To understand what 'greenspace' meant in relation to each programme, and how the greenspace used by each programme differed, we asked four questions on the definition of area (e.g. wilderness, forest, public park, etc.), ownership (e.g. public or private), distance from nearest town or city in kilometres, and size of the greenspace each programme used in acres.

2.1.4. Section C: Programme components

The main body of the survey included 54 statements based on the seven programme theories developed in our previous review (Masterton et al., 2020). The survey was designed so that each statement tested an individual context, mechanism, or outcome discussed in the review. Seven statements representing contexts, mechanisms, and outcomes were given relative to each programme theory, and five additional statements were included at the end which represented unconfigured contextual factors identified in the realist review as important, but not yet linked to mechanisms and outcomes. Inclusion of these unconfigured contextual factors in the survey was deemed important, since any identification of diverse opinion across respondents would indicate that these factors should be explored further in future research to identify their impact on programmes. To further aid understanding of survey design, Table 1 explicitly shows the contexts, mechanisms, and outcomes within each identified programme theory in our review (Masterton et al., 2020) and maps how each of these components, as well as the five unconfigured contexts, were tested with the corresponding survey statement in this current study. It is important to note at this point that, although context, mechanisms, and outcomes typically appear as a "context + mechanism = outcome" configuration heuristic in realist research (Pawson & Tilley, 1997), and appeared as such in our

Table 1
Contexts, mechanisms, and outcomes within each identified programme theory in Masterton et al. (2020) and the corresponding survey statement in this current study.

Each programme theory and all CMO components, as evidenced in Masterton et al. (2020), including the direct quotation and page number from the review	Corresponding survey statement testing each component
Escape and Getting Away (PT1): If there is easy access to a quality, spacious, greenspace environment, then there will be a reduction in stress and mental fatigue, because the participant feels calm, relaxed, and away from their day to day stressors, particularly if they have previous negative experience of traditional health services where they have felt enclosed.	**Escape and Getting Away (PT1) - represented by surveys statements 1 to 7**
Context: Outside is a more spacious environment Direct quote: "they [participants] no longer felt as if they were confined within four walls" (p.6)	1. Greenspace programmes provide a more spacious environment than other therapy programmes which are typically run indoors (C)
Context: Previous experience in indoor, more traditional health services Direct quote: "the greenspace setting was particularly effective for participants who had previous experience of more typical treatments such as counselling, as they no longer felt as if they were confined within four walls" (p.5/6)	2. Service users who have had previous experience in indoor health services often prefer outdoor greenspace programmes because they feel less enclosed (C)
Context: A high quality environment with various sensory stimuli Direct quote: "The feeling of being away, relaxed, and removed from daily life, was shown to be further facilitated by sensory stimuli present in the environment" (p.6)	3. The greenspace environment provides a sensory experience (C)
Mechanism: Feelings of calm Direct quote: "when a person is immersed in nature this leads to feelings of calm" (p.5)	4. Greenspace provides a calming effect for service users (M)
Mechanism: Feeling removed from daily stressor Direct quote: "immersion in nature allows a person to feel removed from their everyday life and, therefore, from their everyday stressors. This feeling of escape, or 'getting away', is a key mechanism in the success of greenspace programmes." (p.5)	5. Being in greenspace allows service users to feel removed from their daily stressors (M)
Outcome: Participant is mentally refreshed Direct quote: "In this programme theory, stress levels and mental fatigue were reduced" (p.6)	6. Service users report that they feel mentally refreshed after working in greenspace (O)
Outcome: Participant's stress is reduced Direct quote: "In this programme theory, stress levels and mental fatigue were reduced" (p.6)	7. Service users report that they feel less stressed when working in greenspace (O)
Space to Reflect (PT2): If the client accesses greenspace which provides a backdrop for therapeutic conversations, then as long as there is adequate space and time spent on the programme, this results in increased desire to change, because of increased opportunity for reflection and because participants see changes in nature around them which they attribute to changes in their own lives.	**Space to Reflect (PT2) - represented by surveys statements 8 to 14**
Context: Length of programme Direct quote: "change could take months to become apparent." (p.7)	8. change in service users' behaviour does not happen quickly on greenspace programmes (C)
Context: Time on programme Direct quote: "The context of adequate time spent on the programme was a refinement to this programme theory since change and reflection did not happen quickly" (p.7)	9. The longer service users participate in greenspace programmes, the more they benefit from them (C)
Context: The greenspace environment facilitates conversations Direct quote: "nature was providing a 'backdrop' where therapeutic conversations and activities were more accessible." (p.7)	10. Therapeutic conversations seem easier in greenspace than in other environments (C)
Mechanism: Greenspace allows time to reflect Direct quote: "an integral part of this programme theory is that time alone in greenspace can allow participants to reflect on their lives." (p.7)	11. Time alone in greenspace allows a service user time to reflect on their lives (M)
Mechanism: Metaphors Direct quote: "the desire to change could be facilitated by metaphors encountered within the programme and participants applying these to their own lives" (p.7)	12. Service users find that changes in plants, trees, or the environment, can represent changes in their own lives (M)
Mechanism: Greenspace allows space to reflect Direct quote: "participants spoke about the physical space allowing them to reflect in a prolonged and undisturbed way, both when sitting and walking. This, in turn, can increase their awareness of the need for change in their lives" (p.7)	13. The physical space on greenspace programmes allows service users space to reflect on the need for change in their lives (M)
Outcome: An increased desire to change behaviours and/or coping strategies Direct quote: "awareness of the need to change was achieved" (p7)	14. By the end of the programme, service users have a desire to change behaviours and/or coping strategies in life outside of the programme (O)
Physical Activity (PT3): If there are a variety of activities available, and if participants are prepared for anticipated challenges, and if programmes have the right resources such as funding and staff, then this will lead to increased physical activity and improved mood because clients will have feelings of accomplishment and enjoy the activities they do.	**Physical Activity (PT3) - represented by surveys statements 15 to 21**
Context: Availability of experienced facilitators Direct quote: "six studies stressed the importance of having confident, adequately trained facilitators to enable and lead activities" (p.7)	15. It is essential to have experienced facilitators leading activities in greenspace programmes (C)
Context: Availability of funding Direct quote: "availability of resources to adequately support and fund programmes and their materials is imperative to provide a variety of activities" (p.7)	16. Greenspace programmes need secure funding in order to provide a range of activities (C)
Context: Existing awareness of physical challenges Direct quote: "realistic expectations of anticipated challenges did appear to be an influencing context in the lead up to programme uptake in some circumstances. Gabrielsen et al., (2019) suggest that clearly informing and preparing participants for any challenges prior to the programme commencing is advisable" (p.7)	17. It is important to inform service users of anticipated physical challenges as this makes it easier for them to cope with these challenges when they appear (C)
Mechanism: Variety of activities Direct quote: "With a diversity of activities available, participants are more likely find an activity that they enjoy and will engage with" (p.7)	18. A variety of activities increases the likelihood of service users engaging with a programme (M)

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Table 1 (*continued*)

Each programme theory and all CMO components, as evidenced in Masterton et al. (2020), including the direct quotation and page number from the review	Corresponding survey statement testing each component
Mechanism: Feelings of accomplishment Direct quote: "[participants] described how, even though they felt tired during physically challenging hikes, they still felt happier when taking part and therefore found it easier to push themselves." (p.7)	19. Service users report feelings of accomplishment after a physically demanding activity (M)
Mechanism: Enjoyment of activity Direct quote: "enjoyment of physical activity facilitates engagement and, in turn, leads to increased physical activity" (p.7)	20. If a service user enjoys the activity, this will lead to increased uptake of the activity (M)
Outcome: Increased physical activity and mood improvement Direct quote: "with increases in physical activity, improvements in mood are also seen" (p.7)	21. Increased physical activity on the programmes leads to improvements in mood of service users (O)
Self-Efficacy (PT4): If there are available, experienced facilitators to lead programmes, then clients will learn new physical and psychological skills which increases self-esteem and confidence in applying new skills in their lives outside of the programme, and once it has finished, because of increased feelings of empowerment relating to their ability, particularly relating to coping with physical and psychological challenges.	**Self-Efficacy (PT4) - represented by surveys statements 22 to 28**
Context: Availability of experienced facilitators Direct quote: "the availability of adequately trained facilitators is necessary to enable participants to learn new skills" (p.13)	22. Experienced facilitators are important for service users to learn new skills (C)
Mechanism: Coping with challenges Direct quote: "teaching skills such as coping with challenges were present across programme type" (p.13)	23. Working in greenspace requires service users to overcome challenges at times (M)
Outcome: Learnt practical and psychological skills Direct quote: "Learned skills can be practical tasks" "Learned skills can also be skills such as self-regulation of emotion, and coping strategies" (p.13)	24. Service users learn both practical and psychological skills such as goal setting, coping with challenges, and self-regulation of emotion (O)
Mechanism: Feelings of empowerment Direct quote: "another identified change in reasoning was an increased feeling of empowerment when learning new skills" (p.13)	25. Learning new skills allows service users to feel empowered (M)
Outcome: Confidence and self-esteem from new skills Direct quote: "service users who learned and mastered new skills had increased self-esteem, pride, and confidence" (p.7)	26. Learning new skills allows service users to feel more confident about themselves (O)
Outcome: Application of skills outside of the programme Direct quote: "psychological skills are particularly important in facilitating self-efficacy post-programme enabling service users to integrate new skills into their lives" (p.13)	27. Skills learnt on greenspace programmes are transferable to service users' lives outside of the programme (O)
Outcome: Ability to cope with challenges post-programme Direct quote: ""skills development can lead to increases in pride, self-esteem, and confidence, as well as in self-efficacy for individuals to implement new skills in their life outside the programme" (p.13)	28. Learning new skills allows service users to feel more confident in overcoming challenging circumstances after the programme ends (O)
Having a Purpose (PT5): If a programme provides structure, and if there are available, trained facilitators to lead programmes for an adequate length of time, then clients were more positive and excited about life, because of increased responsibility, feeling valued, and a sense of routine and purpose.	**Having a Purpose (PT5) - represented by surveys statements 29 to 35**
Context: Length of time on programme Direct quote: "time spent on a programme has been shown to be correlated with achieving outcomes" (p.13)	29. The longer a participant spends engaged in a programme, the more skills they can learn (C)
Context: Programmes are structured by nature Direct quote: "greenspace interventions were shown to be most effective when there were structured programmes in place" (p.14)	30. Greenspace programmes are most effective in improving mental wellbeing when they are structured (C)
Mechanism: Feelings of routine Direct quote: "Feelings of purpose were also gained from the routine that programmes provided" (p.14)	31. Service users can find the routine on the programmes helpful for their mental wellbeing (M)
Mechanism: Feelings of responsibility Direct quote: "The mechanisms of feeling responsible and purposeful were seen across all programme types" (p.14)	32. Activities on greenspace programmes gives the service user feelings of responsibility (M)
Mechanism: Feeling valued Direct quote: "Participants spoke about feeling valued and appreciated for their work, which was motivating" (p.13)	33. Service users feel valued on greenspace programmes (M)
Mechanism: Sense of purpose Direct quote: "The mechanisms of feeling responsible and purposeful were seen across all programme types" (p.14)	34. Service users feel a sense of purpose on greenspace programmes (M)
Outcome: Increased excitement for life Direct quote: "participants felt more hopeful and excited about life in general" (p.14)	35. Service users report increases in their excitement for life, after taking part in greenspace programmes (O)
Relationship with Facilitator (PT6): If facilitators appear non-judgemental, friendly, and confident, and meet the clients at the start of the programme who have previous negative experiences of healthcare professionals and who find it difficult to build relationships, and if facilitators do activities alongside clients, then clients are more like to buy into programmes and engage with aftercare support, because they feel empowered, included, and that there is less of a power imbalance between facilitators and clients.	**Relationship with Facilitator (PT6) - represented by surveys statements 36 to 42**
Context: Previous experience with healthcare professionals Direct quote: "the influence of previous relationships with healthcare professionals is a contextual factor in how well participants initially engaged with programmes" (p.15)	36. Previous experiences with healthcare professionals can influence how a service user responds to programme staff (C)

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Table 1 (*continued*)

Each programme theory and all CMO components, as evidenced in Masterton et al. (2020), including the direct quotation and page number from the review	Corresponding survey statement testing each component
Context: Existing challenges with building relationships Direct quote: "many programme users had experienced difficult interpersonal relationships and problems developing trust" (p.15)	37. Service users often report that they have difficulty in building relationships (C)
Context: Non-judgemental staff attitudes Outcome: Engagement Direct quote: "facilitators who appeared non-judgemental, open, and genuine, enabled relationships to be built quickly with participants." (p.15)	38. Non-judgemental, positive attitudes from staff are important in order to initially engage service users (C/O)
Context: Availability of confident and friendly staff for those with previous negative experience Direct quote: "previous negative experiences can negatively impact engagement, particularly for adolescents who may show lower levels of trust towards all adult relationships after a negative experience. There is some evidence that this might be mitigated by ensuring that each participant is met by a confident and friendly facilitator at the start to help engage participants" (p.15)	39. If a service user has previous negative experience of other health services, it is helpful for them to be met by a friendly, confident member of staff prior to the programme starting (C)
Mechanism: Feelings of empowerment and inclusion Direct quote: "some study participants described how facilitators would ask them what they wanted to do, eat, and which way to go allowing participants to feel empowered, decreasing power imbalances, and promoting inclusion" (p.15)	40. It is important to give service users choice in how they take part in the programme, as this can empower them (M)
Mechanism: Reduced feelings of power imbalance from "doing with" mentality of facilitators Direct quote: "Involvement of the facilitators in the same tasks as the service users led to decreased perceived power inequality" (p.15)	41. By taking part in greenspace activities themselves, programme staff can reduce inequalities in power between staff and service users (M)
Outcome: Continued engagement post-programme Direct quote: "the stronger the relationship between programme user and facilitator, the more likely participants were to fully engage with programmes and available aftercare support" (p.15)	42. High levels of trust and rapport between staff and service users increases the likelihood of service users accepting support after the programme (O)
Shared Experiences (PT7): If the greenspace programme provides a "real-life" environment in comparison to typical treatment environments for an adequate amount of time, and if participants saw others engaging in the programme, then participants saw increases in social skills, because they felt a sense of belonging within the group, and reduced judgement by others during shared experiences.	**Shared Experiences (PT7) - represented by surveys statements 43 to 49**
Context: Others engaging Direct quote: "the engagement of others on the programme can be a contextual factor to be aware of, with the success of social interactions being a two-way process" (p.15)	43. Service users are more likely to engage with the programme if they see others engaging with it (C)
Context: Time on programme Direct quote: "Time spent on the programme is another key contextual factor for social cohesion to occur. As previously mentioned, change does not happen instantly and social changes, in particular, can take longer to occur compared to psychological, physical, physiological, or cognitive changes" (p.15)	44. Service users can take a long time to build relationships with other service users (C)
Context: Greenspace as a more natural 'real life' environment Direct quote: "the group environment might be described as more like 'real life' than traditional therapy" (p.15)	45. The shared environment on a greenspace programme feels more natural than group therapy typically undertaken indoors (C)
Mechanism: Sense of belonging Direct quote: "the community feel of the greenspace programme was the most valued aspect mentioned" (p.15)	46. Service users find a sense of belonging with peers on greenspace programmes (M)
Mechanism: Feeling less judged Direct quote: "Mechanisms identified in this programme theory that led to improved social outcomes were the group environment feeling safe and lack of stigma and judgement" (p.15)	47. Service users feel like there is less judgement with peers when on greenspace programmes (M)
Mechanism: Sharing experiences Direct quote: "It is through these shared experiences that participants experience increased social skills" (p.15)	48. Greenspace programmes allow service users to have shared experiences (M)
Outcome: Increased social skills Direct quote: "It is through these shared experiences that participants experience increased social skills" (p.15)	49. Greenspace programmes allow increases in social skills (O)
Unconfigured contextual factors	**Unconfigured contextual factors - represented by survey statements 50 to 54**
Small groups are preferred	Small groups are preferred by service users over larger groups
Gender differences in benefits gained	Greenspace programmes are still seen as 'alternative' and this can limit service user engagement
Cultural differences in benefits gained	There are gender differences in how service users benefit from greenspace programmes
Programmes are still seen as 'alternative'	There are age differences in how service users benefit from greenspace programmes
Age differences in benefits gained	There are cultural differences in how service users benefit from greenspace programmes

proposed framework (Masterton et al., 2020), they were separated into individual components in this study as it allowed us to test each of them individually and identify where exactly agreement or disagreement lay. If the configuration was kept as a whole, we would only be able to gain insight into the full configuration, rather than explore each part.

Respondents indicated on a 5-point Likert Scale (where 1 = strongly disagree and 5 = strongly agree) the extent to which they agreed or disagreed with each statement. No negatively worded items were used since previous research has shown little evidence of advantages of alternating positive and negative statements (Sauro & Lewis, 2011). Indeed, alternating positive and negative items can also be misinterpreted, confusing, and lead to a higher number of mistakes (Van Sonderen et al., 2013). To address this, statements were created to be as neutral and non-leading as possible, and all statements were discussed and agreed by the full research team.

To test the survey before distribution, a pilot survey was sent to five lay people to check for any errors and to ensure that survey items were clear and easy to understand. Minor adjustments such as wording and punctuation were made in response to suggested edits. No questions or statements were added or removed.

2.2. Participant inclusion/exclusion criteria

Survey participants were required to work on programmes which utilised outdoor greenspace as a core part of their programme. Participants working on outdoor programmes not using greenspace did not meet the inclusion criteria. Given our aim of comparing responses from those working on programmes that support people with problem substance use and those that did not, participants were not required to work on programmes that supported this client group. However, all participants had to work on programmes which had an aim of improving client mental wellbeing. Additionally, all participants had to be working on a programme based in Scotland, were service managers, programme facilitators, or in another staff role, and were over 18 years of age. Participants were required to complete an online consent form and confirm that they met the inclusion criteria prior to beginning the survey.

2.3. Recruitment and setting

A total of 133 survey participants were recruited online. Initially, the survey was distributed via email to relevant existing contacts of the research team. The research team then undertook extensive mapping to identify as many greenspace organisations as possible across Scotland. This work involved searching existing databases such as the Trellis map of projects (Trellis Scotland, 2020), the Paths For All map of health walks (Paths For All, 2020), and the mapping undertaken by the four Green Health Partnerships (NatureScot, 2019). Trellis also provided contact details for organisations not in the public domain. Organisations were also identified via websites, social media (Twitter, Facebook, LinkedIn), and through word of mouth. This mapping allowed us to collate a range of greenspace organisations, including those that we knew explicitly supported groups of people with problem substance use. To ensure that as many relevant organisations were contacted as possible, including any we had not identified in our own mapping, email recipients were asked to forward the survey to other relevant organisations. The survey link was also shared via Twitter, inviting greenspace programme staff to take part if they met the inclusion criteria. This meant that it was not possible to identify how many people subsequently received the survey, and we were therefore unable to calculate the exact survey response rate. However, the respondents represented a very high proportion of the organisations we had identified through mapping. Further, given that our search for relevant organisation was extensive, this allowed us to deduce that the number of respondents from programmes identified outside of the initial mapping work who were sent the survey, but did not complete it, is likely to be low.

2.4. Data analysis

Descriptive statistics were reported to summarise the diversity of greenspace organisations and stacked bar charts showed overall patterns of responses. This allowed identification of which statements had the largest variability in answers overall. We then explored whether variability in responses could be explained by programme setting. Programme setting was identified as urban, rural, or both using reported greenspace setting in the survey (urban/rural/both), distance from town in kilometres, and examining the OS MasterMap Greenspace Layer (Ordnance Survey, 2020). Urban areas were designated as those where urban cover was shown to be the dominant land type within a 1-km grid

Table 2
Characteristics of programmes.

Programme characteristics	Overall	
	%	N
Location (Region of Scotland)		
Aberdeen & Aberdeenshire	6.3	4
Argyll & Inner Hebrides	4.7	3
Ayrshire & Arran	12.5	8
Dundee & Angus	9.4	6
Edinburgh & The Lothians	18.8	12
Greater Glasgow & Clyde Valley	18.8	12
Stirling, The Trossachs, & Forth Valley	6.3	4
Perthshire	1.6	1
The Highlands	6.3	4
Scottish Borders	1.6	1
Programme runs in different regions	14.1	9
Public/Private/Third Sector		
Public Sector	15.6	10
Private Sector	3.1	2
Third Sector	75	48
Not sure	6.3	4
Programme age range		
Children and young people (< 16)	14.1	9
Over 16	59.4	38
All age ranges	25	16
No answer	1.6	1
Does the programme aim to improve mental wellbeing?		
Yes	98.4	63
No	0	0
No answer	1.6	1
Does the programme support people with problem substance use?		
Yes - people with problem drug and alcohol use	35.9	23
Yes - people with problem alcohol use only	7.8	5
Yes - people with problem drug use only	0	0
No	39.1	25
Not sure	17.2	11
Greenspace characteristics of programmes	**Overall**	
	%	**N**
Setting of greenspace programme		
Rural forest/wood/open space	23.4	15
Urban woodland/hill/forest	15.6	10
Urban park/garden/allotment	34.4	22
Other	3.1	2
Different settings used	23.4	15
Greenspace size		
<0.5 acres	7.8	5
1-1.5 acres	14.1	9
2-4 acres	12.5	8
5+ acres	46.9	30
All different sizes used	3.1	2
Not sure	14.1	9
No answer	1.6	1
Distance (in km) from nearest urban area (town or city)		
In an urban area	46.88	30
1-5 km	25.0	16
6-10 km	6.25	4
11-20 km	3.13	2
21+ km	6.25	4
Different distances depending on which area used	3.13	2
Not sure	7.81	5
No answer	1.56	1

square (Boughey et al., 2011). To test for differences in responses between programme setting we used Kruskal-Wallis ANOVAs (Siegel & Castellan, 1988). These tests were appropriate since ordinal data are not suitable for parametric tests, and Likert data are ordinal, bounded, and discrete. The dependent variable in each test was the response to survey statements and the categorical variable was the greenspace programme setting (rural/urban/both). When the Kruskal-Wallis test showed significant differences between programme settings (rural/urban/both), Mann-Whitney tests were run as post-hoc tests to determine which groups differed from each other. To control for the inflation of Type 1 error rate, a Bonferroni adjustment was used. The adjusted p-value was calculated by dividing the alpha value (0.05) by the number of comparisons made.

To examine whether there were differences in responses between programmes explicitly supporting those with problem substance use and those that did not, we firstly calculated each respondent's median response scores across the seven statements within each programme theory, as described in Table 1. When creating an overall response score for each programme theory, it is good practice to check that all combined items are measuring the same underlying construct and that the score is therefore reliable (Laerd Statistics, 2018). We ran Cronbach's Alpha which allowed us to examine the internal consistency of each programme theory. Kruskal-Wallis ANOVAs were then used to test for differences in survey responses between respondents from organisations that support people with problem substance use and those from organisations that do not. The dependent variable was median score for each programme theory, and the categorical variable was intended beneficiary group (problem alcohol use only, both drugs and alcohol, neither, not sure). 'Drugs only' was not included as a categorical variable as no organisations fell into this group. Again, Mann-Whitney tests were run as post-hoc tests to determine which groups were significantly different from each other and a Bonferroni adjustment was used to control for Type 1 errors.

3. Results

3.1. Characteristics of programmes: what exists, where, for whom, and with what focus

The survey was completed by 64 people representing 55 separate organisations. Programme characteristics including programme location, whether the programme was in the public sector, private sector, or third sector, programme aims, and age range of clients, are reported in Table 2. Greenspace characteristics of programmes are also reported in Table 2 to highlight the diversity of greenspace used across programmes.

3.2. Overall trends for the framework

Figs. 1–8 show responses from strongly agree to strongly disagree for each statement (n=7) within each programme theory. Survey statements, as seen on the Y-axis of each graph, are shown as descriptors and represent a context (C), mechanism (M), or outcome (O) from each programme theory. The full survey statements and their corresponding descriptors are listed in Appendix 2. The percentage of respondents choosing each response from strongly agree to strongly disagree is shown on the X-axis of each graph.

Respondents showed a high level of agreement with the programme theory *'Escape/Getting Away'* with 93.8%–100% of respondents agreeing or strongly agreeing with the statements aside from the statement 'less enclosed' where 64% of respondents agreed or strongly agreed (Fig. 1).

Respondents showed a high level of agreement with the programme theory *'Space to Reflect'* with 75%–87.5% of respondents agreeing or strongly agreeing with the statements aside from the statement 'changing environment represents client changes' where 65.6% agreed or strongly agreed, and the statement 'change in behaviour does not happen quickly' where only 15.6% agreed or strongly agreed (Fig. 2).

Respondents showed a very high level of agreement with the programme theory *'Physical Activity'* with 79.7%–93.8% of respondents agreeing or strongly agreeing with the statements. There was also a very high level of agreement for the programme theory *'Self-Efficacy'* with 84.4%–100% of respondents agreeing or strongly agreeing with the statements (Figs. 3 and 4 respectively).

Respondents showed a high level of agreement with the programme theory *'Having a Purpose'* with 76.6%–95.4% of respondents agreeing or strongly agreeing with the statements aside from the statement 'structured programmes are most effective' where 62.5% agreed or strongly agreed (Fig. 5).

Respondents showed a high level of agreement for the programme theory *'Relationship with Facilitator'* with 84.4%–98.5% of respondents agreeing or strongly agreeing with statements aside from the statement 'previous experience with health professionals' where 67.2% agreed or strongly agreed, and the statement 'difficulty in building relationships' where 54.7% agreed or strongly agreed (Fig. 6).

Respondents showed a high level of agreement for the programme

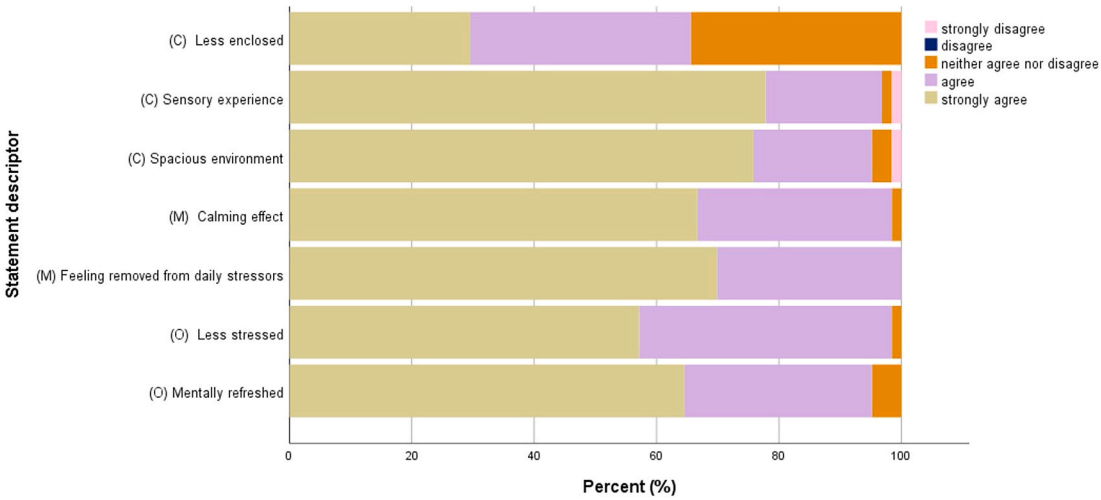

Fig. 1. Percentage of responses from strongly agree to strongly disagree for each statement within the programme theory *'Escape/Getting Away'*.

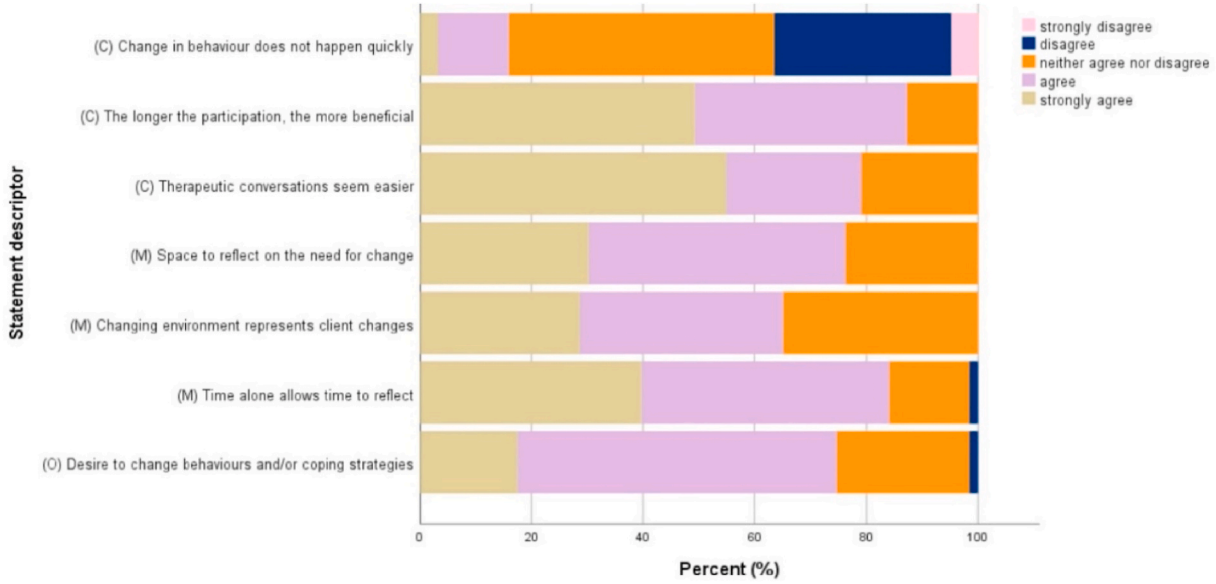

Fig. 2. Percentage of responses from strongly agree to strongly disagree for each statement within the programme theory *'Space to Reflect'*.

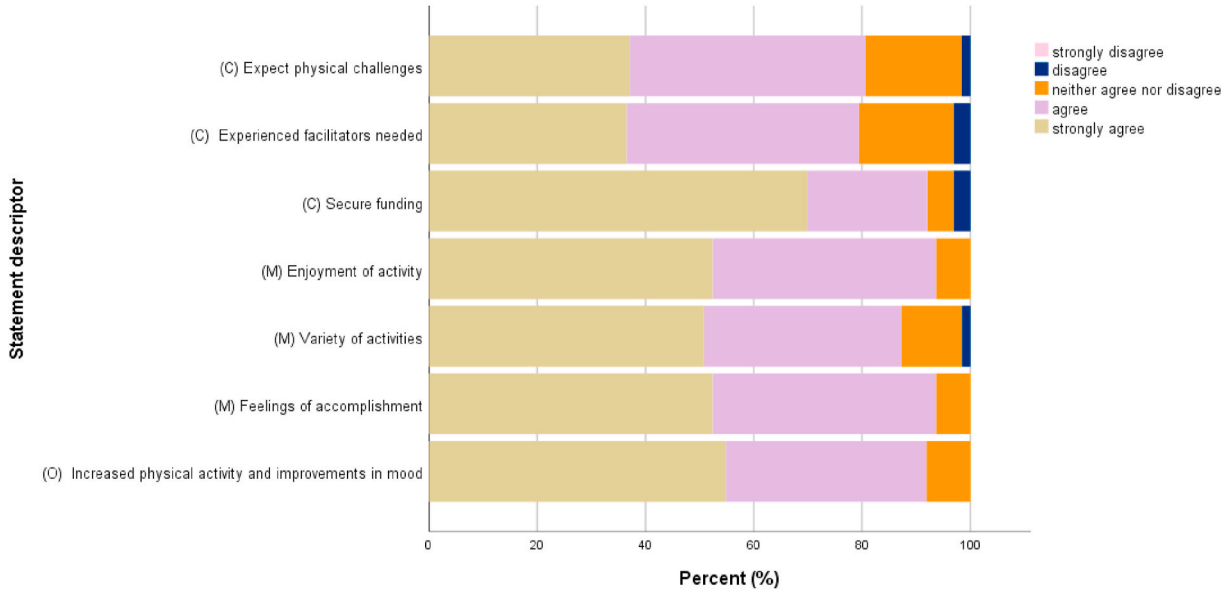

Fig. 3. Percentage of responses from strongly agree to strongly disagree for each statement within the programme theory *'Physical Activity'*.

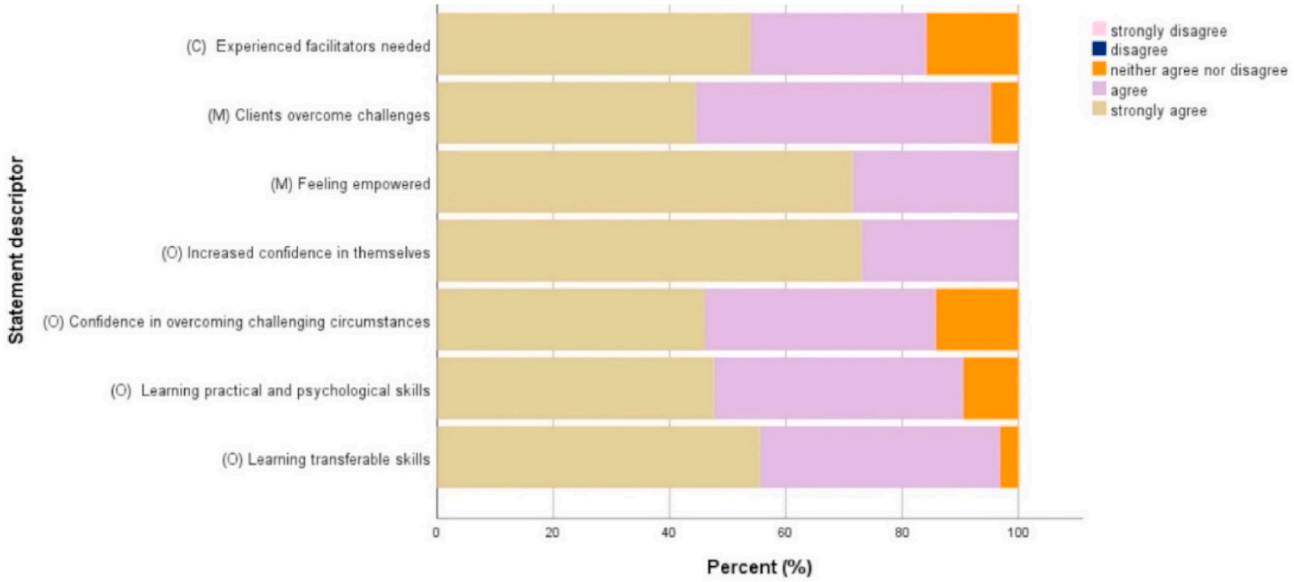

Fig. 4. Percentage of responses from strongly agree to strongly disagree for each statement within the programme theory *'Self-Efficacy'*.

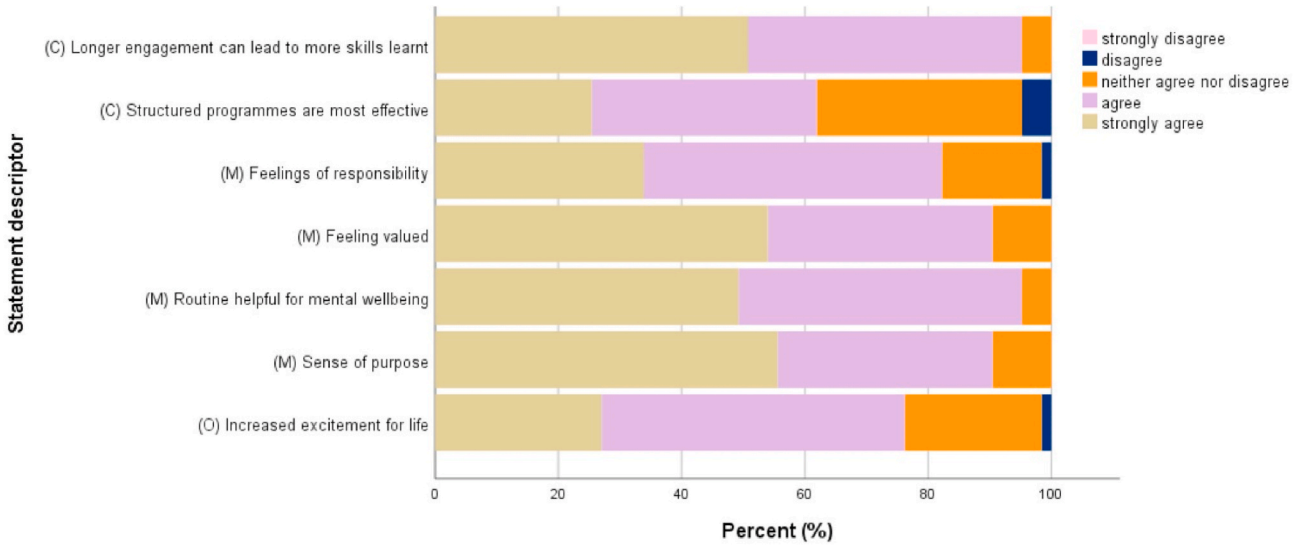

Fig. 5. Percentage of responses from strongly agree to strongly disagree for each statement within the programme theory *'Having a Purpose'*.

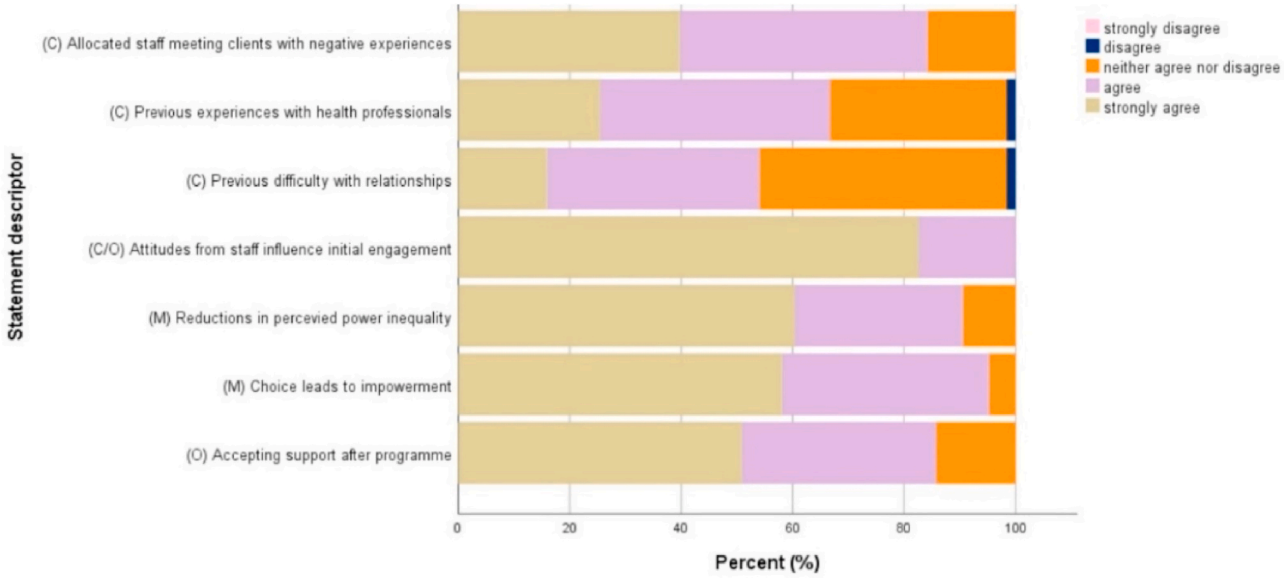

Fig. 6. Percentage of responses from strongly agree to strongly disagree for each statement within the programme theory *'Relationship with Facilitator'*.

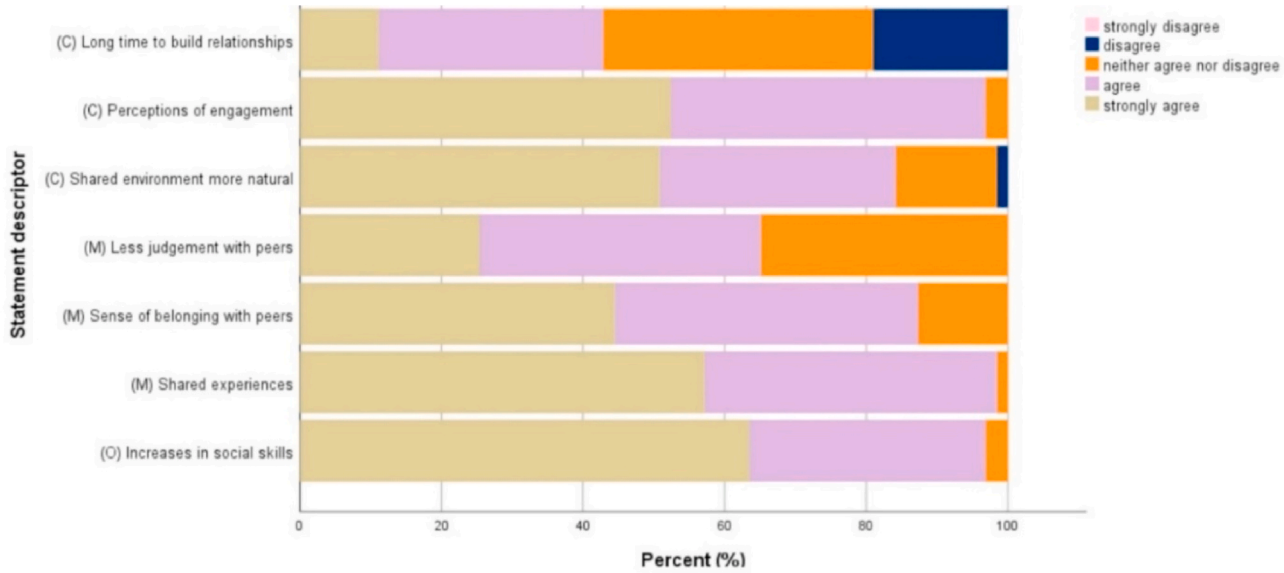

Fig. 7. Percentage of responses from strongly agree to strongly disagree for each statement within the programme theory *'Shared Experiences'*.

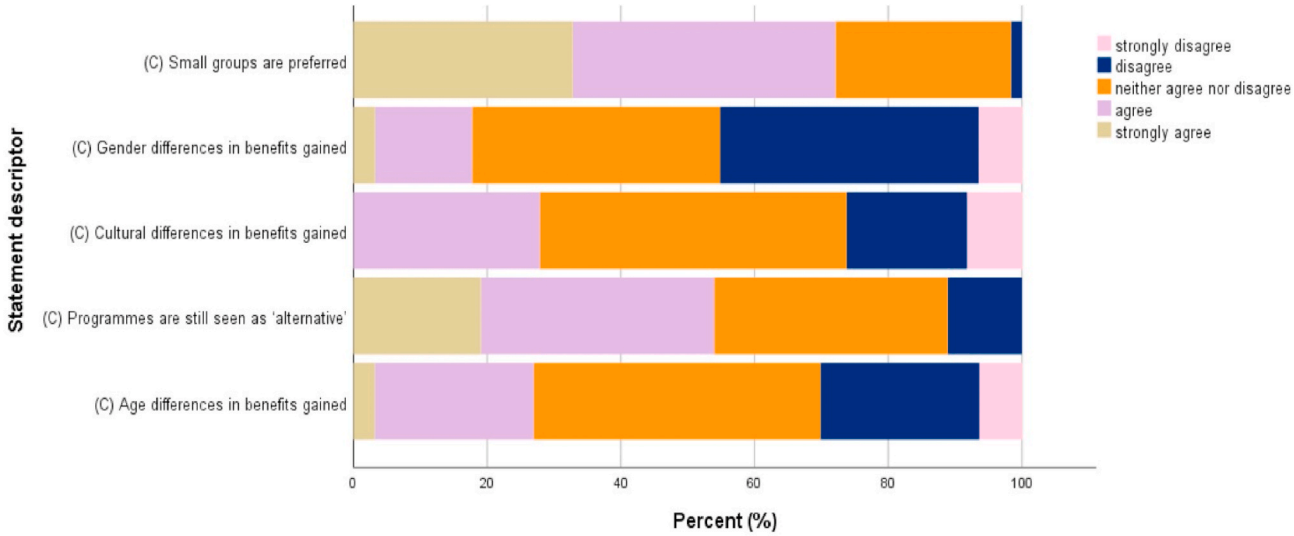

Fig. 8. Percentage of responses from strongly agree to strongly disagree for each unconfigured contextual statement.

theory *'Shared Experiences'* with 84.4%–98.5% of respondents agreeing or strongly agreeing with statements aside from the statement 'less judgement with peers' where 64.1% agreed or strongly agreed, and the statement 'long time to build relationships' where only 41% agreed or strongly agreed (Fig. 7).

Finally, respondents showed a lower level of agreement with statements provided for the extra unconfigured contextual statements included in the survey. Only the statements 'small groups are preferred' and 'programmes are still seen as 'alternative' showed over 50% of respondents agreeing. Less than 26.6% of respondents agreed or strongly agreed with the other three statements. All statements showed a greater variability in responses compared to the seven programme theories (Fig. 8).

Descriptive statistics showing the number of respondents who selected each response score for the survey statements (on a 5-point Likert scale where 1 = strongly disagree and 5 = strongly agree), the corresponding percentage for each statement, and the median score for each statement are provided in Appendix 3.

3.3. Testing the transferability of the framework for different greenspace settings

A wider range of response scores for a statement demonstrated a higher variability in agreement. Despite our claim that the framework is applicable for all greenspace programmes (Masterton et al., 2020), differences in responses could be due to the setting of greenspace used. If over 30% of responses fell outside of 'agree' or 'strongly agree', we examined whether the responses differed according to whether the programme was rural-based, urban-based, or if it was based in both rural and urban settings. Of the 54 statements, 11 met the criteria and were tested. The dependent variable in each test was the survey statement and the categorical variable was the greenspace setting (rural/urban/use both).

The only statistically significant difference in responses between respondents from rural programmes, urban programmes, and programmes that use both settings was for the statement 'greenspace programmes are most effective in improving mental wellbeing when they are structured' ($\chi^2(2) = 7.29$, $p = 0.03$). Respondents from rural programmes agreed more with greenspace programmes being most effective when they are structured (Mean Rank = 33.95) compared to those from urban programmes (Mean Rank = 23.06) (U = 210.0, $p < 0.01$). This remained significant with a Bonferroni adjustment ($p = 0.017$). There were no differences in agreement about the effectiveness of structured programmes between respondents from urban programmes (Mean Rank = 21.39) and from programmes that use both urban and rural greenspace (Mean Rank = 21.85) (U = 156.5, $p = 0.91$), or between respondents from rural programmes (Mean Rank = 18.25) and from programmes that use both urban and rural greenspace (Mean Rank = 12.65) (U = 71.5, $p = 0.09$).

There were no other statistically significant differences in statement responses between respondents from urban programmes and from programmes that use both urban and rural greenspace. Table 3 shows the Kruskal-Wallis H test results for all tested statements.

3.4. Testing the transferability of the framework for problem substance use

For each respondent, a total score was calculated by taking the median of the seven statements that made up each programme theory. Cronbach's Alpha confirmed internal consistency indicating that the overall scores were reliable (see Table 4). The internal consistency was good for six of the programme theories and was acceptable for one. The internal consistency for the extra contextual items was judged as acceptable but borderline, as typically a Cronbach's Alpha value of 0.6 and higher is acceptable.

There was a statistically significant difference in the total programme theory score for '*Relationship with Facilitator*' between respondents from programmes that supported people with problem alcohol use only, both drugs and alcohol, neither, and/or those who were not sure ($\chi^2(2) = 9.45$, $p = 0.02$). Relationships with facilitators was rated as more important (a higher overall score) in programmes that supported people with problem alcohol use (Mean Rank = 22.0), compared to programmes that did not support this client group (Mean Rank = 14.20). However, with the adjusted alpha rate (p=0.008) there was no significant difference (U = 30.0, $p = 0.04$). Respondents from organisations that supported people with problem alcohol use also rated

Table 3
Kruskal-Wallis H test results showing differences in statement responses between respondent from urban programmes, rural programmes, and programmes that use both urban and rural greenspace.

	Statement descriptor (see Appendix 3 for full corresponding statement)											
	Less enclosed	Change in behaviour does not happen quickly	Changing environment represents client changes	Structured programmes are most effective	Previous experiences with health professionals	Previous difficulty with relationships	Long time to build relationships	Less judgement with peers	Programmes are still seen as 'alternative'	Gender differences in benefits gained	Age differences in benefits gained	Cultural differences in benefits gained
χ^2	0.43	0.36	2.51	7.29	1.44	0.003	2.86	2.30	0.44	3.25	4.10	0.42
df	2	2	2	2	2	2	2	2	2	2	2	2
p	0.81	0.83	0.28	0.03*	0.49	0.998	0.24	0.32	0.80	0.20	0.13	0.81

χ^2 = Chi-square value; df = degrees of freedom; p = p-value.
* indicates significant p-value at <0.05.

Table 4
Cronbach's Alpha test for internal consistency of survey statements in each programme theory and for extra contextual statements.

Programme theory name	Cronbach's Alpha	Rating
1 - Escape/Getting Away	0.82	Good
2 - Space to Reflect	0.68	Acceptable
3 - Physical Activity	0.71	Good
4 - Learning New Skills	0.83	Good
5 - Having a Purpose	0.85	Good
6 - Relationship with Facilitator	0.78	Good
7 - Social Relationships	0.75	Good
Extra contextual statements	0.58	Borderline

relationships with facilitators as more important (Mean Rank = 12.50) compared to respondents who were not sure if their organisation supported people with problem substance use (Mean Rank = 6.68). However, with the adjusted alpha rate (0.008), again there was no significant difference (U = 7.50, p = 0.01). There were no significant differences between respondents from programmes that supported people with problem alcohol use only (Mean Rank = 19.0) and those that supported people with problem drug and alcohol use (Mean Rank = 13.52) (U = 35.0, p = 0.10); neither (Mean Rank = 19.84) and not sure (Mean Rank = 15.45) (U = 104, p = 0.20); or neither (Mean Rank = 22.44) and problem drug and alcohol use (Mean Rank = 26.74) (U = 236.0, p = 0.23).

There were no other significant differences in overall programme theory scores between respondents from programmes that supported people with problem substance use, from programmes that did not, and respondents who were not sure. Table 5 shows the Kruskal-Wallis H test results for differences in overall programme theory scores between groups.

4. Discussion

The positive influence of greenspace on mental health is now widely acknowledged and, although not without its limitations (Husk et al., 2016), much empirical research supports the association (Barton & Pretty, 2010; Callaghan et al., 2020; Hartig et al., 2014; Hartig & Kahn, 2016; Hystad et al., 2019; White et al., 2019). Globally, there are now many types of greenspace programmes for mental health (Masterton et al., 2020; Robinson et al., 2020; Barton et al., 2016). However, while greenspace may have a positive effect on mental health, it is still unclear by what pathways this occurs. In our previous paper (Masterton et al., 2020) this gap was explored, and a framework was proposed consisting of seven programme theories. In this current study, we tested the transferability of the proposed framework by collecting primary data from staff on greenspace programmes in Scotland. We also tested the applicability of the framework to greenspace programmes for people with problem substance use.

4.1. Characteristics of programmes: what exists, where, for whom, and with what focus

Across Scotland, there was a wide geographical spread of programmes, with respondents from organisations in ten different regions, and with 14% of respondents indicating that their organisations ran programmes in various regions. Three quarters of the programmes were run by third sector organisations, such as charities, voluntary programmes, and social enterprises. There was a wide range of ages catered for across programmes, with one programme for under-fives, ranging to programmes for adults up to the age of 70. A quarter of respondents indicated that they provided services for all age ranges. All programmes supported clients to improve or maintain their mental wellbeing. Just under 36% of programmes supported problem alcohol and illicit drug use, approximately 8% supported problem alcohol use only, and just

Table 5
Kruskal-Wallis H test results showing differences in overall programme theory scores between respondents from programmes that support alcohol only, drugs and alcohol, neither, and those who were not sure.

	Programme theory name							
	Escape/Getting Away	Space to Reflect	Physical Activity	Self-Efficacy	Having a Purpose	Relationship with Facilitator	Shared Experiences	Extra contextual factors
χ^2	1.67	3.85	2.28	1.17	2.88	9.45	2.41	2.38
Df	2	2	2	2	2	2	2	2
P	0.64	0.28	0.52	0.76	0.41	0.02*	0.49	0.50

χ^2 = Chi-square value; df = degrees of freedom; p = p-value.
* indicates significant p-value at <0.05.

over 39% did not support people with problem substance use of any kind. Greenspace setting varied greatly across programmes with approximately 23% using rural greenspace, 16% using urban woodland or forests, 35% using parks, gardens, or allotments, and 23% indicating that various settings were used in the programme. The size of greenspace used in programmes ranged from less than half an acre, to over five acres. Just under half of the programmes (46.9%) were in an urban area.

The results demonstrated the heterogeneity of greenspace programmes for mental health and showed that the classification of greenspace appears to be relative to each programme, with no clear definition across programmes. The variety of greenspace identified is supported by the Scottish Government's Planning Advice Note for Planning and Open Space (2008), where 11 separate classifications of greenspace are listed under the 'open space' heading. The variability in our study highlights the importance of clarity in terminology. In a previous review of 125 greenspace articles, less than half of the included articles included a definition of greenspace (Taylor & Hochuli, 2017). If there is a lack of clarity in terminology, not only will this likely lead to confusion (McIntyre et al., 2008), but could also limit research findings. For example, when exploring what aspects of greenspace are most important for health, researchers need to be explicit about what type of greenspace is being explored. Research on engagement with nature and greenspace for health may be challenging if there is little objective clarity about what nature or greenspace means within the context of that study. To address this, we suggest that the meaning of greenspace specific to each study should be explicitly communicated to better enable understanding. It is important to highlight that, from a practical viewpoint, a greater variety of greenspace programmes could be beneficial for including as many people in programmes as possible. However, a lack of consistent terminology is likely to provide challenges for service providers too, particularly when developing initiatives such as green prescriptions (Van den Berg, 2017).

It is important to note that while this study does not claim to provide in-depth mapping of programmes across Scotland, the pre-work in identifying existing programmes to recruit was extensive. Furthermore, the general trends of availability of different programmes are supported by existing databases such as the Trellis map of projects (Trellis Scotland, 2020), the Paths For All map of health walks (Paths For All, 2020), mapping undertaken by the four Green Health Partnerships (NatureScot, 2019), the MasterMap Greenspace Layer (Ordnance Survey, 2020), and previous empirical research on the geographical spread of green prescribing (Jepson et al., 2010; Robinson et al., 2020).

4.2. Generalisability of the framework to greenspace programmes for mental health in Scotland

Since programme theory development is an iterative process, the proposed programme theories from our previous review (Masterton et al., 2020) were tested in response to the new primary data. This testing was important since it was unclear if mechanisms and outcomes within our proposed programme theories, such as the feeling of escape and having space to reflect, would be as applicable to urban programme settings compared to rural programme settings. Results showed there were high levels of agreement with the survey statements overall, indicating that the results of this study strongly support the seven proposed programme theories for greenspace programmes. This suggests that the proposed framework effectively represents the key contexts, mechanisms, and outcomes seen in greenspace programmes for mental health, as presented in our review (Masterton et al., 2020), and shown in this paper in Table 1, allowing us to understand *why* programmes work, rather than solely *if* programmes work. This finding is important as it extends the scope of the framework from representing empirical evidence only, to being a potentially useable framework in practice.

Further testing of the framework was also necessary to provide evidence for the claim that the framework was generalisable to greenspace programmes internationally. If the framework was internationally relevant, then it should be successfully applicable to greenspace programmes in any chosen country. Results showed that the framework can be taken and tested successfully in a Scottish setting with very high levels of agreement from greenspace practitioners. We propose that our findings from Scotland could be generalisable to other countries, due to the breadth of greenspace typologies as well as the variety of greenspace programmes included in the data. Many of the Scottish programmes identified for inclusion in this survey mirror programmes that were present in the realist review from different countries (Masterton et al., 2020). Therefore, if the programme theories translate well to Scottish programmes, then we suggest that the programme theories might also successfully translate to other international settings.

Despite a high level of agreement with the framework overall, the results also allowed us to identify individual statements where there was a greater variability in responses. This variability highlighted the areas of the programme theories that potentially need refinement so that the theories more accurately represent the contexts, mechanisms, or outcomes of programmes. We aimed to identify if respondents from programmes that used different greenspace settings responded to these survey statements in different ways. Previous research has reported different aspects of greenspace as being valuable for health. For example, greenspace with less air pollution, noise, and heat has been reported to be more beneficial for human health (Markevych et al., 2017). It is possible, therefore, that staff from programmes using rural spaces might see benefits faster due to higher quality greenspace in comparison to staff using urban spaces. Staff on urban programmes may therefore be more likely to agree with the statement 'change in service users' behaviour does not happen quickly on greenspace programmes'. Equally, staff from urban horticultural programmes might agree that with the statement 'service users find that changes in plants, trees, or the environment, can represent changes in their own lives', more than staff from rural programmes where clients work less directly with changing vegetation.

With this in mind, we explored whether there were significant differences in responses between respondents according to where their programmes are based (i.e. rural, urban, both). Our results showed that there was a significant difference in responses between urban programmes and rural programmes for the statement 'greenspace programmes are most effective in improving mental wellbeing when they were structured', with staff from rural programmes agreeing more with this statement than staff from urban programmes. This might be explained by rural programmes, such as wilderness or adventure programmes, needing to have more structure and planning due to higher potential risks and being longer in duration (Gabrielsen et al., 2018, 2019). There were no other significant differences in responses between groups meaning that staff from urban and rural programmes both agreed overall with the framework for how greenspace programmes work. This is an important finding since it supports our previous claim that the framework is applicable to all greenspace programmes and is transferable across urban-based projects, as well as rural-based projects (Masterton et al., 2020). This is in comparison to other models that only focus on one programme setting, such as Russell and Farnum's Wilderness Therapy Model (2004) and the Care Farm model (Hambridge, 2017). We acknowledge that there are statements that need to be explored further, for example, the additional contextual statements showed a wider range of responses in comparison to statements in the programme theories themselves. We therefore advise a level of caution be applied when interpreting these initial results because, while greenspace setting did not appear to be linked to differences in responses, due to the heterogeneity of programmes, we were unable to categorise programmes more specifically. In future research, exploring other characteristics of programmes may allow us to identify nuances between programmes that do explain differences and help us to further refine the framework.

4.3. Transferability of the framework for problem substance use

Previous systematic reviews and meta-analyses have reported a strong association between mental health and substance use (Hunt et al., 2016; Kingston et al., 2017; Lai et al., 2015). Given the link between mental health and substance use, we were also interested in exploring the framework's transferability and whether the programme theories that explained why greenspace programmes were effective for people with poor mental health, also explained why programmes appear to be effective for supporting people with problem substance use. Our results showed that responses from organisations that support people with problem substance use were not significantly different to responses from organisations that did not support this client group. We therefore suggest that the framework may be applicable to both greenspace programmes specifically for mental health and greenspace programmes that support people with problem substance use. This is important since there is a small body of empirical research that shows beneficial outcomes on greenspace programmes for people with problem substance use (Combs et al., 2016; Harper et al., 2019; Lehmann et al., 2018). However, there is no existing framework, to our knowledge, that shows the components necessary for greenspace programmes to be successful with this client group thus making future development and implementation of programmes difficult.

4.4. Strengths, limitations, and future research

This exploratory study was a novel approach to test and operationalise our previously proposed realist framework (Masterton et al., 2020). We originally proposed that our framework was transferable to all greenspace programmes in all settings. The range of different greenspace programmes included in this study means that this contextual claim is now more convincing, as the range of programmes allowed us to analyse different greenspace programmes with a realist lens and identify similarities. A key strength of this study was that it allowed a focus on 'for whom' and 'why' greenspace programmes might be successful. The results not only showed a general consensus of the framework, they also enabled comparison between different groups to show that the framework could be appropriate for use on greenspace programmes that support people with problem substance use. These findings could subsequently inform development of an initial programme theory to take forward into a realist evaluation of greenspace programmes for substance use support.

Some limitations and the need for future work must also be acknowledged. Firstly, because the survey was distributed both by the researchers and within respondents' networks, it was not possible to identify how many people subsequently received the survey. We were therefore unable to calculate the overall survey response rate. However, as mentioned, our extensive search for organisations to recruit allowed an overview of the number of existing greenspace organisations in Scotland, therefore we believe that the response rate to be fairly high, since the included organisations represented a very high proportion of the organisations we identified through mapping. As with all surveys, we were reliant on respondents accurately reporting their answers and cannot guarantee that respondents will interpret the statements in the way we expect. One potential issue was that we did not explicitly ask how many people with problem substance use there were on the programmes. Therefore, although we know which organisations would be open to supporting this client group, we cannot be certain that respondents were answering with active knowledge about what works or does not work for people with problem substance use. However, our mapping exercise means that we are confident that the programmes that reportedly support people with problem substance use, do actively support this client group.

Further research is needed to better explain apparent differences in responses between some of the survey statements. The survey tested what has already been proposed, and so was unable to identify any new contexts, mechanisms, or outcomes that may be relevant to the overall framework. Additionally, testing contexts, mechanisms, and outcomes separately has implications. Although the reason we did this was to explore individual aspects of the configuration, it could be argued that contexts are only relevant when linked to a specific mechanism and, when they are split, this could result in a loss of understanding about why a context is important. The premise of realist research is establishing causality between contexts, mechanisms, and outcomes, so future work is needed to test the components as full configurations in order to see how they work as programmes theories. Indeed, future qualitative work could enable a deeper exploration of the causality within programme theories, identification of new contexts, mechanisms, or outcomes, and allow unanswered questions to be addressed. It is also important to note that respondent agreement does not confirm that the contexts, mechanisms, and outcomes are ontologically 'real', only that they are agreed upon by this specific group of respondents. This limitation is inherent to all realist research and it is important to be clear that, while programme theories do allow predictions about why programmes work, they are potentially fallible (Pawson & Tilley, 1997). This is another reason why future work is imperative, so that the contexts, mechanisms, and outcomes continue to be tested and refined in order to provide further evidence for the proposed programme theories.

Another important point is that respondents may be basing their answers on generic greenspace programmes delivered by their organisation as a whole, rather than specific programmes. This may mean that nuances between programmes are not picked up, again this is something which should be explored in future work. For example, although we previously proposed that programme activity should not influence contexts, mechanisms, or outcomes, follow up work may look to explore if this is the case, or if there are differences between specific activity types, rather than across rural and urban programmes more generally. This was not possible in this project due to the heterogeneity of programmes thereby limiting our ability to categorise programmes other than urban, rural, or both. Due to heterogeneity, testing between activity type would likely require a large sample size in future work. Finally, the survey only represents one country, and while we suggest that results could translate to an international context, further testing of this claim must take place in future work. In particular, contexts within lower-income and middle-income countries will differ from high-income countries. For example, the health care infrastructure and differing cultural values and uses of greenspace may influence implementation and use across different countries. If the framework is indeed transferable internationally, further work needs to be undertaken to be explicit about whether this does in fact include all countries, or only high-income countries.

5. Conclusion

The mental health benefits of greenspace are widely acknowledged, however, there is still limited understanding of the mechanisms by which greenspace programmes are effective making future development and implementation difficult. We recently developed and published a novel framework for greenspace programmes for mental health (Masterton et al., 2020). We identified key programme theories comprising of contexts, mechanisms, and outcomes that showed what works, for whom, and in what circumstances. The current study tested our proposed framework using primary data from 64 staff of greenspace organisations in Scotland. We were able to identify what exists, where, and with what focus, and our results supported the proposed realist framework. Given the link between mental health and substance use, we were also interested in exploring the framework's transferability for use on programmes for people with problem substance use. We were interested in exploring whether the programme theories for greenspace programmes for positive mental health, were applicable to programmes that support people with problem substance use. Our results showed that responses from organisations that supported people with problem

substance use were not statistically different from organisations that did not support this client group. This shows that the framework has the potential to be applicable to both greenspace programmes for mental health and greenspace programmes for problem substance use support. This is a novel finding as, to our knowledge, there is currently no framework that aids understanding of the contexts, mechanisms, and outcomes necessary for greenspace programmes to be successful for people with problem substance use.

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Appendices. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.healthplace.2021.102669.

Declarations of interest

None.

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