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Embedded Researchers as Part of a Whole Systems Approach to Physical Activity: Reflections and Recommendations

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Abstract: Whole systems approaches are increasingly being advocated as a way of responding to complex public health priorities such as obesity and physical inactivity. Due to the complex and adaptive nature of such systems, researchers are increasingly being embedded within host organisations (i.e., those which facilitate the whole systems approach) to work with key stakeholders to illuminate and understand mechanisms of change and develop a culture of continuous improvement. While previous literature has reported on the benefits and challenges of embedded researchers in health care, little is known about the experiences and learnings of those situated within these complex whole systems approaches. In this paper, we present our reflections of being embedded researchers within four distinct whole systems approaches and outline recommendations and considerations for commissioners working with or seeking support from an embedded researcher.

Keywords: complex systems; embedded researcher; evaluation; public health; physical activity

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1. Introduction

The population levels of obesity, physical inactivity, homelessness, and smoking are all example outcomes of a complex adaptive system [1]. A whole systems approach (WSA) is increasingly being advocated as a way of responding to this complexity [1,2]. Although a formal definition isn't agreed upon, Buck and colleagues see a WSA as "a dynamic way of working, that brings together stakeholders to develop a shared understanding of the challenge, and integrate action to bring about sustainable, long-term systems change" (Pg.17).

WSAs aim to address the shared challenge through changes across a raft of policy, environmental, and organisational practices as well as individual values and beliefs. Whole systems approaches, by their nature, also adapt and respond to local contexts (e.g., COVID-19 significantly impacted the way in which we went about our daily lives). Furthermore, whilst WSAs may aim to improve population health outcomes, it is likely that they will simultaneously work towards (and benefit from or be constrained by) the agendas and outcomes valued by others. For example, taking a WSA towards increasing population physical activity might also benefit the work and agendas of a transport planning team by helping to reduce traffic congestion in town centres.

Evaluating how WSAs work, and trying to better observe, capture, and record associated changes, is inherently difficult. It requires an intricate and nuanced understanding of local processes and what is needed to secure long-term and sustainable change. Interest

around systems thinking in evaluation has gained traction over the last few decades [3,4]. There are a number of approaches which can be adopted to capture the complex and turbulent nature of WSAs [3]. For example, to capture the gap between systems-thinking-in-theory and systems-thinking-in-practice, a shift has been required which draws on more developmental evaluations [5]. To expand, a traditional developmental evaluation calls on evaluators to be embedded in the project or programme [5] and incorporates reflective skills and a repertoire of well-established social science research to inform the continued and future development of the project/programme being implemented [3].

One potentially useful approach, in line with notions of a developmental evaluation, is the role of an embedded researcher; that is, where an academic researcher becomes embedded in the organisation (or collection of organisations) who are facilitating the WSA [6–8]. The existing literature exploring the embedded researcher role does so primarily within a healthcare [7–10] or local authority setting [11,12]. The role of the embedded researcher is to work "with" practice- or policy-based colleagues, rather than simply providing research "on" or "for" them [13]. This process enables the co-creation of knowledge between researchers and stakeholders [11], which can create an effective mechanism for information to be fed back to stakeholders, so that it can be acted upon accordingly for the purpose of continuous improvement [14].

This paper provides a novel and timely contribution to the literature by discussing embedded researcher roles specifically within WSAs. While previous literature has explored the embedded researcher role (e.g., [7,8,11]), there are currently no reported experiences of embedded researchers working within a WSA. Embedded researcher roles are arguably particularly well-suited to the evaluation of WSAs to enable capacity building [15], develop and utilise practice-academic co-produced approaches that are context-sensitive [11], and in providing findings to aid decision making to drive meaningful change [7] in what is a long-term, complex, dynamic, and ever-changing effort made by multiple stakeholders. As recognised within the literature, the embedded researcher model can also be challenging [11,15] and this aspect is explored within the reflections of this paper in relation to WSAs.

The aim of this paper is to present in-practice reflections from five embedded researchers representing four distinct WSAs to physical activity. In doing so, this allows us to present novel insight into the real-world, lived experiences of embedded researchers working closely with a WSA and to, therefore, outline recommendations for embedded researchers in similar roles and offer a novel perspective from and applicable to WSAs. Furthermore, we will outline considerations for commissioners who are working with or seeking support from an embedded researcher as part of their WSA.

2. Materials and Methods

2.1. Embedded Researchers

The author team included five embedded researchers (four female, one male) from three academic institutions who are working or have worked within four WSAs working to tackle physical inactivity and reduce physical activity inequalities. For context, four of the embedded researchers hold doctorate degrees, and one of the embedded researchers is qualified to a Masters degree level. All five embedded researchers were allocated time from their host academic institution to engage with the embedded researcher role. In Table 1, we summarise information both about the WSA and about the role of the embedded researcher within the local organisation(s). We anticipate that this contextual information will be useful to readers, especially those who are considering an embedded researcher role.

Table 1. Information about the WSAs and the embedded researcher roles.

Researcher: AP	
About the WSA	**About the Embedded Researcher and Role**
Name: Active Calderdale. **Initiated:** December 2018. **Footprint:** Calderdale, West Yorkshire, England. Approximate target population of 200,000 people. **Vision:** Everyone in Calderdale has the opportunity, capability, and motivation to be physically active in any way they choose. **Principles:** Active Calderdale is underpinned by a Theory of Change and takes a whole-systems approach to tackling physical inactivity. The mission is to work with communities to make physical activity an embedded part of day-to-day life in Calderdale. **Key partners:** NHS trusts and health and social care providers, voluntary and community organisations and services, workplaces, educational establishments, leisure services, sport providers, parks and green spaces, the built environment, walking and cycling, and planning teams, and local residents. **Host organisation:** Calderdale Metropolitan Borough Council.	**Evaluation period**: August 2019 to present. **Embedded role:** AP was embedded in Active Calderdale on a full-time basis between August 2019 and September 2021. AP transitioned out of the role in September 2021, but a full-time embedded researcher from the same institution took on the role and AP is embedded for one day a week. **Nature of the role:** To deliver on the evaluation of Active Calderdale and understand the process of enabling system change and capture the impact of changes on residents. Being embedded allowed AP to capture daily processes and changes and to identify the approaches that were most appropriate to the localities and partners in Calderdale. AP met with the core team weekly, with the programme team fortnightly, and with senior leaders and key stakeholders bi-monthly. This enabled insight to be gathered and a continuous learning process to be developed.
Researcher: JN	
About the WSA	**About the embedded researcher and role**
Name: We can move (WCM). **Initiated:** April 2018. **Footprint**: Gloucestershire, England. Approximate target population of 640,000 people. **Vision:** WCM aimed to get 10 000 inactive people more physically active. **Principles:** WCM is underpinned by a Theory of Change which includes systems science, behaviour change theory, and social movement building. A core element of WCM is that it creates a social movement whereby people in the community feel empowered to actively promote, champion and undertake the work of WCM. **Key partners:** Local authorities, NHS Trusts and Clinical Commissioning Groups, Voluntary and Community Sector Organisations, local community members and groups. **Host organisation:** Active Gloucestershire. Active Gloucestershire are the backbone organisation for WCM.	**Evaluation period**: April 2019–April 2021. **Embedded role**: JN was embedded in the Active Gloucestershire team for one day per week (until March 2020 due to the COVID-19 pandemic). **Nature of the role**: To improve the quality of the WCM evaluation being carried out. Being embedded in the Active Gloucestershire team meant that JN was able to understand the intricacies of WCM by attending meetings and observing the day-to-day facilitation of WCM. Through discussion with wider stakeholders, JN was able to co-produce elements of the evaluation to ensure they supported continuous service improvement and learning. JN regularly (at least every three months) provided a detailed overview of the evaluation, its findings to date, and the perceived implications for WCM. A final purpose of the role was to provide formal and informal training for the Active Gloucestershire team in evaluation to increase capacity and capability.

Table 1. *Cont.*

Researchers: KS & GF	
About the WSA	**About the embedded researcher and role**
Name: GM Moving. **Initiated:** September 2018. **Footprint:** Greater Manchester (GM), England. Approximate target population of 2,800,000 people. **Vision:** GM Moving is not an organisation or a collective but a 'social movement' to widen access and participation in physical activity, sport, and active travel to create a greater number of more inclusive ways to be active every day. **Principles:** Whole system approach which now considers change in policy, physical environment, organisations and institutions, asset-based community development, families and behaviour change. It operates across and between two layers of social structure. GM wide (through engagement, influence and collective working with other pan GM collectives) and within localities. Important principle that local decision makers and people are empowered to make decisions about what works for them in their locality. **Key partners:** Greater Manchester Combined Authority, NHS in Greater Manchester, Transport for Greater Manchester, GreaterSport, Voluntary and Community Infrastructure. **Host organisation:** GreaterSport.	**Evaluation period:** May 2019 to present **Embedded role:** GF was embedded on a locality basis and KS was embedded in the central evaluation team. **Nature of the role:** To help stakeholders to set out their ideas about what they were trying to do and how this might lead to a sustainable system change which support population level changes in physical activity (even if this change might be observed many years hence). These ideas informed bespoke data collection activities, including individual reflections. KS and GF attended meetings, observed proceedings, asked ad hoc questions, and designed, implemented qualitative and quantitative data collection, and carried out analysis. They facilitated collective sense-making in place. The evaluation approach was rooted in an understanding of the WSA being an attempt to simultaneously orientate multiple interconnected, intersecting parts to encourage physical activity. It drew on systems thinking, complexity science and realist evaluation. Crucial to its execution is a deep understanding of context and a sufficient proximity to the actions of multiple actors in the system to identify patterns of behaviour and how these fit within the wider social, economic, and political cultures and structures.
Researcher: KD	
About the WSA	**About the embedded researcher and role**
Name: You've Got This **Initiated:** July 2018 **Footprint:** South Tees, North East England. Approximate target population of 400,000 people. **Vision:** To create a 'movement' of people within South Tees taking collective action towards the common purpose of *active lives as a way of life.* **Principles:** You've Got This aims to create a social movement for physical activity. The aim is to support local people to incorporate more movement into their everyday. Collaboration is at the heart of the approach and a central team support a wide range of **partners** to work towards the common purpose through aligning funding, fostering partnerships between organisations and working directly with communities and local practitioners. The work is insight and evidence led and built on behaviour change principles and theories. **Key partners:** You've Got This has four 'communities of interest'; 1. Health professionals, 2. Slimming World, 3. Type 2 diabetes and 4. Prehabilitation. You've Got This also has four focus wards, two in each of the local authority areas in South Tees. Grangetown and Southbank in Middlesbrough and Brambles and Thorntree and North Ormesby in Redcar and Cleveland. You've Got This work in partnership with an 'Exchange' of local professionals across public, voluntary, charity and private sectors in South Tees. **Host organisation:** Redcar and Cleveland Borough Council.	**Evaluation period:** November 2019–present **Embedded role:** KD was embedded with You've Got This in the core programme team on a full-time basis until December 2021. **Nature of the role:** To undertake a process evaluation with a focus on professional stakeholders. This involved KD working alongside the core programme team and the wider governance team (Programme Management Office). Practically this involved attending meetings in an observational role, facilitating weekly reflective process learning meetings, facilitating workshops on an ad hoc **basis and** undertaking in-depth data collection on a six-monthly basis to explore a particular area. The role enabled a detailed understanding and collection of data in relation to the context of South Tees as a place, insight and awareness of partnerships, relationships and organisational processes. The role also involved fostering a trusting relationship with the core programme team and developing a learning culture within You've Got This that facilitated open and honest conversation to support meaningful collective sense-making of the work.

2.2. Data Collection and Analysis

We took a five-stage systematic approach to gathering and analysing our reflections. First, we began this process by each embedded researcher (AP, JN, KS, KD, and GF) reflecting individually, without group discussion, on our experiences of being an embedded researcher within the evaluation of a WSA to physical activity. This was important to ensure we did not influence each other's reflections or become biased by one another's experiences. Furthermore, this process was not guided by common questions or topics each researcher had to consider. Instead, it was an opportunity for open and unstructured reflections of each of our experiences as embedded researchers. Next, we came together to discuss our experiences and reflections and identify any commonalities and differences between them. Our experiences were tabulated to identify and document these commonalities. From there, we used an approach similar to that of an inductive reflexive thematic analysis [13]. We followed the six recursive stages outlined by Clarke and Braun [16]: (1) data familiarisation by reading each of our reflections; (2) generating initial codes and collating data pertinent to each code; (3) organising the codes into themes; (4) reviewing each theme to ensure they effectively represented the coded excepts; (5) defining, naming, and refining each theme; and (6) production of this manuscript, which contains experiences relevant to each theme. We also identified considerations for both embedded researchers and commissioners based on our experiences, which are included in the production of this manuscript.

3. Results

We identified four main themes from our reflections of being embedded within a WSA: (1) understanding the role of the embedded researcher; (2) expanding the skill set of the researcher; (3) grappling with the boundaries of the system and the evaluation; and (4) managing competing and conflicting agendas.

3.1. The Role of an Embedded Researcher within a Whole Systems Approach

One role was to illuminate subtle system changes as they emerged. System changes, which may have related, for example, to a shift in policy emphasis, the adoption of new processes or principles, a difference in the way an organisation worked or interacted with others, or the culture of the workforce, can be delicate, precise, even 'invisible' to an outside eye. This may differ from programme or project evaluations where the evaluand is arguably more tightly defined and bounded by changes, or lack thereof, more evident. Being embedded allowed us to develop a deeper understanding of the organisational structures, practices, culture, history, relationships, and personalities of individuals involved in the work and, therefore, better able to identify, describe, analyse, and understand these changes and their potential importance. For example, we observed the time and effort required by practitioners across sectors to develop reciprocal and productive relationships, a core feature of the interdisciplinary nature of a WSA. We were able to illuminate these changes and how they were achieved to both internal and external stakeholders.

A second role was to mobilise evaluation findings as they arose to inform strategy and subsequent actions and activities. This included the forming and development of networks and the initiation of ideas. This may differ from discrete, time limited interventions where process evaluation may inform some developments but often at key stages or milestones, and summative evaluation may be received once the activity has finished. Unlike traditional projects, the WSAs were adaptive, ongoing, and responsive to context. As such, our evaluation findings had to be available to stakeholders in a timely fashion in order to maximise their utility. This altered a traditional view of the evaluator as separate from and entirely impartial to the intervention. Findings that were incorporated into working practices were subsequently part of the intervention and therefore subject to further evaluation. We strove to limit bias by remaining critical of the approaches and seeking non-confirmatory evidence. We were often seen as 'holding a mirror up' for stakeholders to check they were keeping true to principles. This role was not always universally understood, as illustrated below.

One consequence of the role being alongside stakeholders was that it was not always clear to them what we were doing. In the early days of our appointments, we had to work hard to establish that the role was not one of 'spying', 'psycho-analysing', or 'judging' performance, but one of co-producing evaluation and supporting learning in situ. As our roles and relationships developed, we had to balance the practitioners' need to 'off-load' with our position to support them critically reflect. To support a shared understanding of the role, one of us developed a short 'Terms of Reference' (Appendix A), which was informed and supported by previous literature [17–19].

A further challenge we experienced through our role in providing timely feedback was on the occasions where this feedback could be perceived as negative. For context, WSAs assume some level of system change or transformation, which necessarily will be disruptive. Consequently, the information presented by us may have highlighted interpersonal discrepancies or ineffective processes. We were mindful of how the findings may influence the engagement of participants in future evaluation efforts. Secondly, presenting findings to partner organisations which could potentially call into question their effectiveness or the quality of their relationships, could further damage these relationships. We reflected that evaluation findings were better received where we had established learning cultures with stakeholder teams which supported collective sense-making. This provided a 'safe space' for sharing findings and time for those involved to 'work through' the issue in question so that it could be used to direct new approaches.

A third, related, role was to identify necessary adaptations to the evaluation approach in response to the emergent changes in the system. In our experience, as the WSAs matured both in terms of the relationships, networks, actions, and activities and as a consequence of external contexts changing (such as the COVID-19 pandemic), so too did our evaluation framework. This included re-framing the evaluation purpose and methods—including increasing emphasis on learning and collective sense-making—underpinning theories of change. It required vigilance and retention of a critical mindset to identify the moment to adapt, as well as our ability to communicate these recommendations to the wider evaluation stakeholders, such as the research team, supervisors, clients, and ethics coordinators. It also offered the opportunity for us to adopt a coaching role with personnel in the WSA and to share our learnings to help parts of the system develop and thrive.

3.2. Expanding Our Researcher Skill Set

We reflected on the need to have and, more importantly, to continue to innovatively develop our technical and social skill sets to support the evaluation of a WSA. We needed to have a range of methods that we could draw upon to suit the adaptative needs of the systems approach and, in turn, the evaluation. This meant being familiar with a range of traditional methods (e.g., semi-structured interviews, focus groups, document analyses, observations) and learning about new methods (e.g., systems mapping, social network analyses, realist evaluation). Another key aspect was having the opportunity and confidence to creatively adapt or advance methods to enhance their appropriateness for evaluating systems approaches (e.g., ripple effects mapping [20], participatory action research [21], action scales model [22]). Importantly, we did not work in isolation; we were all connected to, and supported by, wider research and evaluation teams either through our host institutions or through existing research connections. It was therefore possible to draw on the expertise of others to support the evaluation; our role here was to act as a conduit between the academic organisation and the systems in which we were embedded and familiar with.

We considered that our social skills were as important as our technical skill set. We all highlighted that ample time was required to establish a strong rapport with the organisations sitting behind the systems approach, albeit that the length of time varied between us. However, different from a traditional embedded researcher or a researcher-in-residence model, we reflected on the need to build rapport with a wide range of individuals of different professional (e.g., senior leaders and chief executive officers) and social (e.g., residents

and community members) backgrounds who have a vested interest in the WSA. As such, we were required to communicate in different ways with these varied audiences. For example, some preferred high-level overviews of the evaluation, some wanted to know about the "impact" of the approach, whilst others wanted more detail about the learning associated with the evaluation. It was through the development of rapport and trust, established over time, that we were better able to understand how to tailor our communication to these audiences. This tailoring included the language and research 'jargon' used, and the way in which we had to frame our messages, so they resonated. We all believed, though, that the investment of time in developing these relationships facilitates the utility and credibility of the evaluation (as a process and the associated outputs), meaning that they are likely to be acted upon.

3.3. Grappling with the Boundaries of the System and the Evaluation

We reflected on the challenges surrounding the boundaries of the evaluation (i.e., which elements of the WSA are within the scope of the evaluation?). Acknowledging that it is impossible to capture and evaluate every activity within a WSA, the priority activities were often selected based on the WSA requirements (e.g., level of investment associated with the activity and potential reach or target group) or our specific skill set (e.g., interview skills and systems mapping skills). We often discussed with stakeholders how to collectively agree on these boundaries. As a result, and at times, there was often a requirement for a pragmatic approach to be taken to the evaluation. We reflected on the importance of being able to communicate regularly with key stakeholders across the system to clarify the boundaries of the evaluation. Developing adaptive protocols to mitigate any associated risk was effective and provided an opportunity to continuously refine and agree on the protocol with the main stakeholders involved in the WSA. This often meant a lot of negotiation and an understanding that some aspects could be evaluated more closely, yet acknowledging that we would not be able to invest as much time in other evaluation activities.

It was important for us to acknowledge that the boundaries of the system and evaluation foci and priorities differ according to perspective. Within the realms of a WSA, this may be dependent on the worldview of stakeholders, how they understand the problem (i.e., physical inactivity), or what they perceive they can influence. There was a greater likelihood that our role, particularly in this WSA context, required integration and deep engagement with several organisations rather than just one (which is typical of a traditional embedded researcher). We noted that this sometimes meant raising awareness of the different perspectives and systems (and systems boundaries) to support consensus making. At times, this meant consciously privileging one perspective for a particular evaluative purpose whilst keeping the wider and potentially multiple systems perspectives in view.

3.4. Managing Competing (and Sometimes Conflicting) Agendas

Our embedded researcher approach helped bridge the gap between academia, local policy, and local practice. While this was beneficial in developing the WSA and the stakeholder team involved, we reflected that it was not without its challenges. Each of these three different vocations (e.g., academia, policymaking, and practice) came with their own agendas and, at times, these agendas were competing and conflicting. For example, within academia, we reflected on the time that is required—often months—to secure ethical approval from the respective research ethics committees. This can, and does, slow down the pace at which academic researchers are seen to be working. Similarly, a large amount of time was required to analyse complex datasets, and this is work that is undertaken "behind the scenes" with little progress to report until the analysis has been completed. In such circumstances, we found it beneficial to be explicit regarding ongoing work and the time required to follow through on academic administration and regulations. We collectively reflected that frequent, open, and honest communication was fundamental between key stakeholders surrounding the evaluation. Keeping stakeholders informed of each research

milestone was beneficial to buffer tensions which sometimes arose and ensured we were a visible and active member of the WSA team.

We also experienced additional, yet well justified, demands on the planned evaluation, predominantly in response to new stakeholders becoming involved in the WSA or the WSA adapting due to changes in local context and circumstances. As an example, COVID-19 required many of the systems approaches to adapt significantly. The focus of the evaluation therefore had to respond accordingly to capture the disruption (both positive and negative) caused by the pandemic. The challenge here was negotiating these changes to the evaluation framework with key stakeholders; from a resource and capacity perspective, researchers could not evaluate everything that was previously planned in addition to focusing on the COVID-19 implications. Initial multi-stakeholder agreement on an adaptive and agile evaluation framework, which allowed resources to be (re)allocated as necessary and made negotiations and partnership working easier. This links back to the need for strong relationships among key personnel, a consideration that can be ameliorated through the embedded researcher role.

4. Discussion

The aim of this paper was to present in-practice reflections from five embedded researchers representing four distinct WSAs to physical activity. Through a systematic approach to collecting and analysing our reflections, we established four key themes that represent our collective experiences: (1) the role of an embedded researcher within a whole systems approach; (2) expanding our researcher skill set; (3) grappling with the boundaries of the system and the evaluation; and (4) managing competing (and sometimes conflicting) agendas.

We reflected on our role as embedded researchers within our WSAs. First, the importance of maintaining impartiality, but also the challenge that comes with providing potentially disruptive feedback. The challenge of dual affiliation may present a state of 'in-between-ness' for the researcher to show commitment to their WSA's goals, but also maintain their host institution's academic standards [12]. As embedded researchers, we were able to have a close and intimate relationship with our WSA, which allowed for not only the research to be tailored to meet the needs of the WSA [23] but also for strong and trusting relationships to be developed between the embedded researcher and those within the WSA [12]. This is particularly advantageous when considering how these relationships can positively impact the data collection process and help others build their knowledge, skills, and capacity to conduct research [24]. Furthermore, our role as embedded researchers allowed us to be responsive and make necessary adaptations to the evaluation approach—in line with the adaptations in the system, the WSA, and the broader context surrounding these (e.g., COVID-19 [25]). This allowed us to develop patterns that drive our thinking and behaviour in order to achieve transformational change, which is particularly pertinent when working within a complex WSA [26].

By expanding our researcher skill set, particularly around methods of evaluating WSAs, we are able to develop evaluation plans which met the needs of the WSA and allow for knowledge that is created to be continuous, evolutionary, and balance a continuous interplay between research methods and developing knowledge [27]. Furthermore, interpersonal skills (e.g., communication skills, relationship-building skills, and emotional intelligence) are highly valued as part of an embedded researcher role [14]. While it is important for any researcher to have interpersonal skills, it is particularly important for embedded researchers within WSAs to have such skills due to the complex and dynamic nature of a WSA and the variety of individuals involved (e.g., stakeholders, local residents, partners). This can also assist in the shared decision-making process and clearly communicate the focus and function of the embedded researcher role and its boundaries [11].

While traditional evaluation projects may work to address individual-level outcomes alone or evaluate every aspect of that project [28], we reflected on the challenges surrounding the boundaries of the evaluation of the WSA we were working in. It was important

for us to acknowledge that it is impossible to capture and evaluate every activity within the WSA. As WSAs do not work in such a linear fashion, a systems approach can help identify the main boundaries and assess the consequences of those boundary choices [29]. Historically, 'boundary spanners' (i.e., individuals have the capability and opportunity to influence decisions based on information gathered) have been used to address issues surrounding boundaries, and they work to connect practitioners with the knowledge to develop organisational capacity to embed research in practice [30]. While this approach has many benefits, an embedded researcher extends those of a 'boundary spanner', particularly in ensuring research is developed and knowledge gained is co-produced through a collaborative and participative process, so it is jointly owned by the researchers and stakeholders within the WSA [6].

Through this process of collecting and discussing our experiences as embedded researchers within a WSA, our experiences lend themselves well to recommendations or suggestions for others. We believe that there are important recommendations for two main groups: current or prospective embedded researchers and those commissioning embedded researchers, which are outlined below.

5. Recommendations

5.1. Recommendations for All

Setting expectations: All parties should set out their expectations surrounding the embedded researcher role. This can help to avoid any tension related to what the role is and is not, and what the evaluation will or will not provide. Working through this early with the commissioner, key stakeholders, and recipients of evaluation findings and the wider academic team can help to establish boundaries and productive ways of working. Documenting this in a terms-of-reference (or similar) can provide a useful reference point to return to or to share with new stakeholders who become involved.

Becoming part of the team: Positive working relationships are essential and an especially rewarding aspect of the embedded researcher role. Steps to encourage the embedded researcher to become one of the team through invitations to meetings, workplaces, and events like conferences or awards celebrations will help facilitate trust, communication, and integrity of the work. Additionally, efforts to co-produce reports and wider outputs for dissemination of evaluation findings will help share ownership of the evaluation.

Organise regular timepoints to debrief and reflect: Frequent (weekly, biweekly, or monthly) reflection sessions support ongoing engagement with the evaluation and the ability of the embedded researcher to share findings in a timely fashion to stakeholders. This also enables and promotes transparency in reporting where findings have been raised and discussed prior to writing.

5.2. Recommendations for Researchers

Importance of context: The benefits the role can bring to stakeholders is in illumination of how change may or may not be occurring based on the range of historical, structural, and interpersonal contexts in place. It is essential to develop a deep curiosity about 'why the context is the way it is' for findings to have local resonance and be impactful.

Maintaining impartiality: Systems change is, by nature, disruptive and destabilising, and this will inevitably highlight practices and processes which are not conducive to the desired goals. It is important to provide honest but constructive feedback to support change. It is also important to develop the space and skills to coach stakeholders to use the information in a way that is transformative.

Defining the boundaries of the system: It is impossible to evaluate everything. Maintain a reflective account explaining choices in research enquiries, and why some elements deemed outside the scope of the research and or evaluation.

Importance of perspectives: As WSAs mature, they often grow in terms of the reach and diversity of stakeholders involved or affected by the changes, who will have different perspectives on the overall ambition and methods for achieving change. It is important

for the embedded researcher to seek out these diverse perspectives to reflect the pattern of change (or lack thereof) more accurately and to illuminate the diversity of viewpoints which may inform future strategy.

5.3. Recommendations for Those Commissioning Embedded Researchers

Academic bureaucracy: Anticipate that due to many of the processes within academia (e.g., ethical approvals, publication time lags, data analysis), elements of the work may move more slowly than anticipated outside of academia. Where possible, build in time for these processes, which ultimately will support the rigour, quality, and credibility of the work.

Be adaptable and flexible: Encourage and expect the evaluation approach to adapt as the work develops. This is one of the benefits of having an embedded researcher, but it has governance implications. Build flexibility into contracts that allow for adjustments to methods, outputs, and deliverables.

6. Strengths and Limitations

While we have shared our collective experiences, it is important to highlight the potential strengths and limitations of the experiences we have shared. First, the strengths of our work: We have provided novel insights into the role of an embedded researcher within a WSA. While these are specific to the WSAs we work within, they provide resonance to other embedded researchers within their WSAs. However, our reflections may have some potential limitations. For example, our insights are focused on physical activity orientated WSAs and, therefore, may not apply to other WSAs outside the physical activity or public health domain. Furthermore, the experiences provided are solely from embedded researchers and neglect those of wider stakeholders and/or host organisations. A future collaborative approach of this nature would be beneficial to understand the reflections from those commissioning embedded researchers within a WSA.

7. Conclusions

The aim of this paper was three-fold. First, to present in-practice reflections from five embedded researchers working within four WSAs to physical activity. Second, to outline recommendations for embedded researchers in similar roles and to offer a novel perspective from and applicable to WSAs. Finally, to outline considerations for commissioners who are working with or seeking support from an embedded researcher as part of their WSA. We build on the existing literature by highlighting the unique contribution of exploring and utilizing an embedded researcher role within complex WSAs to physical activity.

Being an embedded researcher within a WSA has many similarities with the embedded roles that have been reported elsewhere. For example, we all reflected the need to build a positive working relationship with stakeholders and practitioners, to be recognised as part of the team, in order that we are invited into relevant spaces, important information is shared with us, and that we are listened to and trusted. As noted in the introduction, we reflected in this article on experiences that we perceive arise because of the unique nature of working within a WSA context.

Our reflections have provided some key implications for researchers and for those who look to commission an embedded researcher. Acknowledging both the benefits and challenges of commissioning an embedded researcher, as presented above, it would be challenging to evaluate a complex WSA, and do it well, without an embedded researcher who can help understand changes and unpick how and why they are happening. Furthermore, the embedded researcher role lends itself to a coaching role where there is an opportunity for continuous and shared improvement. Often, this is valued more by WSA personnel than the actual findings of the research and evaluation. Considering the complexity of an embedded researcher role, it lends itself well to capturing the underlying complexities of a WSA and is an approach that should continue to be adopted.

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Appendix A Terms of Reference

Process Evaluation: Terms of Reference and Reminders
What it is:
- Co-produced i.e., we are doing it together, not me doing it to you.
- Collective sense-making about your work: this takes time and involves 'back and forth' whilst we explore optimal ways of working.
- Supportive and learning approach—'finding our feet' and 'building trust'.
- Yours; to help you understand the work you are doing.
How we are doing it:
- Using a combination of realist methodology and systems thinking.
- Focusing on stakeholder interactions and tracking system change.
- Developing 'program theory' or hypotheses about how things might work, for whom, in what circumstances, how and why.
- Developing program theory involves observation, reflection, planning, acting, revising how we think about things.
- Gathering 'evidence' from different places, e.g., observational notes and reflections, conversations (informal and formal), attending meetings, reading documents, interviewing stakeholders.
- Helping to create a space for you to reflect and stay true to your ideas, principles, and goals.
What it is not:
- Surveillance, spying or catching you out.
- Monitoring, performance management or reporting back on you.
- Personal/individual or psychoanalysis.

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