Interdisciplinary working in public health research: a proposed good practice checklist

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Abstract

Background: Guidance on how different disciplines from the natural, behavioural and social sciences can collaborate to resolve complex public health problems is lacking. This paper presents a checklist to support researchers and principle investigators to develop and implement interdisciplinary collaborations.

Methods: Fourteen individuals, representing ten disciplines, participated in in-depth interviews to explore the strengths and challenges of working together on an interdisciplinary project to identify the determinants of substance use and gambling disorders, and to make recommendations for future interdisciplinary teams. Data were analysed thematically and a checklist was derived from insights offered by participants during interview and discussion among the authors on the implications of findings.

Results: Participants identified 18 scientific, interactional and structural strengths and challenges of interdisciplinary research. These findings were used to develop an 18-item BASICS checklist to support future interdisciplinary collaborations. The five domains of the checklist are: 1) **B**lueprint; 2) **A**ttitudes; 3) **S**taffing; 4) **I**nteractions; and 5) **C**ore **S**cience.

Conclusion: Interdisciplinary work has the potential to advance public health science but the numerous challenges should not be underestimated. Use of a checklist, such as BASICS, when planning and managing projects may help future collaborations to avoid some of the common pitfalls of interdisciplinary research.

Introduction

Interdisciplinary working is beneficial for understanding and resolving complex public health problems.[1-3] Substance use and gambling disorders present a useful case study of this issue. Research in this field has typically been conducted in studies involving one or a few closely related disciplines,[4] although some countries (e.g. Denmark) have a longer history of interdisciplinary drug and alcohol research.[5] In recent years there has been an increase in large interdisciplinary collaborations, research funders explicitly seeking to support cross-disciplinary collaborations, and researchers recognising that adopting a narrow disciplinary perspective limits the development and effectiveness of solutions to substance use and gambling disorders.[6] [7] Despite the proliferation of interdisciplinary research in recent years, guidance on the challenges encountered and ways to avoid or overcome those challenges is scarce and often originates outside of the field of public health.[8-14]

Interdisciplinary tensions identified from research in other fields include different disciplinary worldviews, 'disciplinary chauvinism', the absence of constructive methods of conflict resolution, and insufficient time reserved for team building activities.[8-10] Well-developed general project management mechanisms are argued to be particularly important in interdisciplinary projects where the team is likely to be larger than usual and potentially more difficult to manage because of the involvement of a number of independent experts without a clear hierarchical structure.[11] Generating shared understanding,[12] for example through interactive working, discussion of language differences and avoiding implicit or explicit power struggles between disciplines, is key to overcoming the complex differences between disciplines in the way research questions are asked and answered.[13] Further, the development of a clear strategy for mining different disciplines with a specific endpoint in mind is fundamental for successful interdisciplinary research.[14]

Despite participants in successful interdisciplinary collaborations generally believing they are beneficial for developing solutions to complex and multidimensional issues, few of these collaborations provide a

transparent account of their methods and challenges encountered that can be used to support future research projects.[14,15]

During a 5-year project to develop interdisciplinary understanding of the determinants of substance use and gambling disorders, our research team encountered unexpected challenges related to the interdisciplinary nature of the work. These challenges prompted a qualitative study to explore researchers' reflections on the strengths and challenges of working in an interdisciplinary project. Using that data, the aim of this paper is to draw together a checklist to support researchers and principle investigators who have limited experience of developing and implementing interdisciplinary collaborations.

Methods

Research concept

ALICE RAP (Addiction and Lifestyles in Contemporary Europe – Reframing Addictions Project) was a 5-year pan-European project that aimed to stimulate debate and advance synergy among sciences that address substance use disorders and addictive behaviours.[16] This paper focuses on the interdisciplinary experiences of a group of experts from eight countries working on one component of the project and tasked with collating evidence on the determinants of substance use and gambling disorders.[17] Interdisciplinary research is defined here as an interactive collaboration between disciplines, drawing evidence from single disciplines into a coordinated and coherent whole.[18] Most experts represented a single discipline and these included genetics, neurobiology, psychology, economics, marketing, public policy, history, anthropology, and sociology. Discipline experts were a mixture of senior professors, mid and early-career researchers: several of the former worked with pre- or post-doctoral researchers who attended and contributed to the meetings.

The research process began with each expert producing a written review of their discipline's current knowledge relating to the determinants of transitions in substance use and gambling (Figure 1). These reviews were then synthesised by two dedicated facilitators (one natural and one social scientist) who worked with discipline experts to produce an interdisciplinary report and visual models of the results.

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Communication was via biannual meetings of the whole team, face-to-face meetings between facilitators and individual discipline experts, teleconferences and email.

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Study design and data collection

Qualitative interviews were used to explore discipline experts' perspectives, understanding and experiences[19] of interdisciplinary working in the ALICE RAP project. In January 2014, two-thirds of the way through this 5-year project, all team members (n=20) were invited by email to participate in an interview to discuss their experiences of working on the project. Fourteen experts representing 10 disciplines across the broad spectrum of social, behavioural and natural sciences involved in the project were interviewed. Informed consent was obtained prior to interview. A topic guide was used to focus each interview on the research objectives, including the strengths of the team's approach to interdisciplinary working, challenges encountered, and recommendations for future interdisciplinary teams. Data was collected by telephone (n=11) and face-to-face interview (n=3). Interviews were audio recorded and transcribed verbatim. Data was anonymised at the point of transcription.

As participants might discuss colleagues working on the project, careful consideration was given to ensuring anonymity and confidentiality to encourage participation and an open and honest discussion in interviews. Only LG knows which team members participated and all quotations were approved for use by participants. Ethical approval was granted by the ScHARR Research Ethics Committee at the University of Sheffield.

Data analysis

Data analysis was concurrent to data collection to enable the inclusion of questions relating to emerging themes in subsequent interviews,[20 21] and because one researcher led both data collection and analysis the process was inherently intertwined. To reduce the risk of researcher bias, an independent co-investigator (EH) with no links to the ALICE RAP project assisted with data analysis. The co-investigator independently

analysed 20% of the data and discussed their findings with the lead researcher to check for convergence and divergence, to reduce the potential for researcher bias and improve the rigour of the project.

Analysis used an inductive approach to develop an *a posteriori* framework. The first stage of analysis identified key phrases that could be used to develop an initial coding frame.[22] This coding frame was refined as it was applied across all transcripts, with key themes relating to the strengths and challenges of the approach to interdisciplinary working identified through a process of constant comparison.[23] Interpretation identified themes in the data from both descriptive and explanatory perspectives. A checklist for future interdisciplinary collaborations was derived from insights offered by participants and discussion among the authors on the implications of findings drawn from the thematic analysis.

Results

Participants identified 18 scientific, structural and interactional strengths and challenges related to the interdisciplinary nature of this project (Figure 2). These strengths and challenges are described below.

INSERT FIGURE 2 ABOUT HERE

Scientific

Participants described the importance of working in a team with researchers who believe that interdisciplinary research is important for addressing complex problems. However, dominant themes identified across interviews were the core scientific challenges of agreeing concept definitions and developing criteria for evidence when collating discipline knowledge:

> I think everyone was a bit surprised that it took so much time tuning into each other's
> way of talking about phenomena… (I10).

As these core scientific challenges took much longer than anticipated to resolve during project development, there was a widespread perception that both the scale of the project had been underestimated and that the project was under-resourced for the level of involvement required from each discipline:

> … people probably felt they were slightly underfunded for the amount of time they
> needed to spend with the project and all being senior experts probably didn't have
> quite enough time to engage with the process between the meetings (I14).

Structural

Flexibility to shape the direction of work, within the broad scope of the project, was valued by discipline

experts. However, variation in the depth and length of single discipline reviews and the absence of clear

expectations for written output created tensions and hindered progress:

> I think getting some clear agreement early on exactly when things would happen and
> how much time people would be expected to put in and then being able to insist on
> that rather than having some vague agreement of what might be produced but that
> wasn't actually written down in any great detail… would have probably helped us in
> the long run (I4).

This resulted in, for example, challenges to evidence synthesis when discipline experts contributed reviews

of vastly different methodology, length and quality despite efforts to impose some uniformity. Further, there

was an absence of a clear route to high-level outputs beyond the formal project reports. As each discipline

contributed reviews which summarised well-established knowledge in their own discipline, they were not

usually able to publish these reviews independently. This meant that the new scientific contributions for the

project were bound up in the interdisciplinary synthesis rather than the work of any particular expert. As a

result, uncertainty about the potential for peer-reviewed publications was a commonly identified threat to

both enthusiasm for the project and career development:

> It's been really hard to see how we get other kinds of deliverables or outputs out of it -
> how can we, for example, write articles up… (I11).

Experts acknowledged that the absence of clear project outputs was, in part, a reflection on the different

forms of publication that disciplines prioritise.

Project staffing was also perceived to be of elevated importance in interdisciplinary research. One risk

identified was that some disciplines were represented by just one expert and this meant if that expert left

then the whole discipline would also be lost from the project. Interdisciplinary synthesis was facilitated by a

pair of dedicated facilitators who were perceived to have performed a key, time-intensive role in supporting

the discipline experts to work together:

> I think it's absolutely necessary that we have somebody to do it or someone to do it. I mean I don't think there would have been a report if you guys hadn't been there… (I9).

However, changes in the dedicated facilitators during the project meant the individual working latterly in this role had a comparatively superficial understanding of the project, its activities to date and of disciplines beyond their own scientific training. Thus, staff turnover was perceived to have had a greater impact on progress than would have been experienced in a project involving one or related disciplines.

Finally, the wide geographical dispersion of the research team across Europe was widely perceived to have hindered progress by limiting the number of face-to-face meetings:

> Having different disciplines is hard enough, but having different disciplines in different cultures in different countries, with a very limited amount of face-to-face time… I think was a step too far (I14).

Interactional

The inclusive approach of the leadership team, both in respect to the involvement of a range of different disciplines and rotating leadership with different disciplines leading different strands of the work, was a perceived strength of the project. Further, there was a view that the experts had been generous and open with their disciplinary expertise, including being able to engage non-experts in their discipline and being reflexive about the limits of their discipline. For example:

> I guess that's what you were trying to foster, wasn't it, that kind of space where people could, not just see the strengths in what their disciplines could bring to the table, but also the questions that they couldn't answer (I8).

Diverse methods of communication were used to facilitate a collaborative approach to working. However, face-to-face meetings were perceived to be particularly important for fostering interdisciplinary understanding, enabling networking with colleagues and the development of social contracts that increased the likelihood that experts delivered work outside of meetings:

> … meetings also create social bonds between researchers so if you don't feel obliged to do it because you get the money, you feel obliged to do it because everybody is so nice and we wouldn't want to let you down… (I11).

A recurrent theme was how the tone in which these meetings were conducted influenced project success, with the generally friendly atmosphere facilitating the sharing of views through lively discussion:

> I think it's all been friendly, robust scientific discussion, I don't think there's been any personal axes to grind, there's been no egos, none of that really, I think everyone's entered into it with a generosity of their discipline to try and contribute really (I12).

However, a view expressed by a few participants was that those with stronger personalities or seniority could dominate meetings, resulting in a hesitancy to share views:

> … some of us are just starting our career, or more or less, [and] we work with people who are worldwide experts. Sometimes you feel a little bit shy to express yourself in front of these experts (I1).

More exceptionally, it was perceived by some experts that other disciplines were not interested in their contributions, which influenced those experts' levels of engagement with the project over time.

BASICS Checklist

Through examining the strengths and challenges highlighted by interview participants, an 18-item checklist was developed to support future interdisciplinary projects (see Table 1). Some items reflect good general project management, highlighting the importance that participants placed on good project management for facilitating interdisciplinary research.

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Blueprint

Key challenges were rooted in project design and planning, suggesting the need to develop a realistic project blueprint. For example, ensuring a feasible scope and timeframe and establishing a clear output plan [checklist items(CI)-1&2]. Given the core science challenges of interdisciplinary work, the blueprint should reflect that a considerable proportion of time might be dedicated to reaching shared definitions, language and understanding. A plan for disciplinary integration is also important to formalise expectations in research partners [CI-3]. Flexibility to adapt the blueprint in response to emerging challenges should help to ensure an

element of resilience within the project [CI-4].

Attitudes

A belief in the importance of interdisciplinary research was perceived to underpin the success of interdisciplinary research. As such, it is important to understand the motivations for participating in such projects and to establish clear expectations around the scientific and interactional challenges the work might engender [CI-5&6]. Further, discipline experts should be prepared to be reflexive about the strengths and limitations of their own discipline, and to share this with other team members to support the interdisciplinary learning process [CI-7]. The aim is to create a methodological pluralism[24] where colleagues are enthusiastic of varied research approaches and accepting of the diverse types of evidence that can be used to understand the system under study.

Staffing

Staffing resilience is important, particularly in relation to discipline representation and managing staff turnover. Having a senior and junior partner in each discipline should help to sustain interdisciplinary engagement between meetings [CI-8], and having at least two interdisciplinary facilitators to minimise loss of knowledge of working practices in the team after staff turnover, should increase resilience [CI-9&10].

Interactions

Participants highlighted the need for frequent interactive face-to-face meetings [CI-11]. This can be hindered if the team is geographically dispersed so careful consideration should be paid to where discipline experts are located [CI-12]. Adequate time should be reserved in early meetings to establish and formalise ways of working together, with further opportunities to reflect on how the team is functioning over time [CI-13]. All disciplines should be encouraged to participate in meetings and to discuss progress and challenges together in a supportive environment [CI-14]. Between meetings, a range of methods could be used to maintain communication between team members and facilitate project progress [CI-15].

Core Science

Interdisciplinary teams should be explicit about the core science challenges inherent in their work, and reserve adequate time in early meetings for developing a shared understanding of the role of different disciplines within the team, as well as agreeing definitions of core concepts, ways of working together, and reviewing expectations [CI-16,17&18). This resonates with the theory of pluralistic dialoguing[25] used to understand how interdisciplinary teams function in clinical settings and which examines the importance of including a deconstructive stage in team development to allow stereotypes to be broken down and contradictions to be exposed. This may help to minimise the risk of misunderstandings and conflict in later stages of the interdisciplinary project.

Discussion

Main finding of this study

Interdisciplinary research can support the development of nuanced solutions to real world problems; however, such projects should be regarded as inherently more challenging than equivalent uni-disciplinary work. We identified 18 scientific, structural and interactional factors that supported or hindered progress of the project. Dominant strengths included the openness of discipline experts to sharing discipline knowledge and the friendly atmosphere during face-to-face meetings. Key challenges included the resource intensive process of agreeing core concepts, staffing resilience and a lack of clear expectations for project outputs.

Drawing on the experiences of these discipline experts, as well as existing literature on interdisciplinary research,[8-12 26 27] we have developed an 18-item BASICS checklist to support future interdisciplinary collaborations (see Table 1). We hope that using this checklist will help researchers new to interdisciplinary research avoid common pitfalls when developing and implementing interdisciplinary projects.

What is already known on this topic?

Many of the scientific, structural and interactional challenges identified here are consistent with previous research in other fields of study. The importance of developing good relationships between researchers from different disciplines is particularly important for facilitating successful interdisciplinary research.[27] Talking frequently to develop working relationships, maintain progress and sustain enthusiasm for the project is important as interdisciplinary research is a process that requires negotiation and compromise,[28] with continuity of and variety in contact over time to stimulate conversations, forge links and strengthen relationships.[29 30]. Such debate and discussion can only be sustained through frequent and varied forms of interaction between members of the research team.

Other factors that resonate with previous research include challenges around the differences in disciplinary language and forms of evidence used by different disciplines,[8] and the need to build an appropriately skilled team, clarify roles and responsibilities, and provide frequent opportunities to discuss progress and findings.[9] However, this research identified additional factors that may influence the success of interdisciplinary projects such as flexibility for all disciplines to be able to shape the developing project, involving discipline experts who are open and generous with their disciplinary knowledge, and the potential role of dedicated interdisciplinary facilitators for developing project outputs.

What this study adds?

This study provides a checklist to support researchers when developing and implementing interdisciplinary research projects. We believe this is the first checklist of its kind for public health researchers. Given the rapid increase in the number of interdisciplinary research projects in recent years,[6 7] there is a need for tools such as BASICS to support researchers in this challenging methodological field.

Limitations of this study

The main limitation of the current research is that the lead researcher was also a dedicated facilitator in the project, which may have introduced bias into data collection and analysis. The use of an external researcher (EH) to validate analysis of interview transcripts mitigated this risk to some extent. Additionally, the small

pool of potential participants may have discouraged any or open participation for fear of recognition in project outputs. To mitigate this risk, the lead researcher did not share interview data with authors in the ALICE RAP team and sought permission to use quotations in dissemination materials.

Conclusions

Sharing experiences of interdisciplinary working can enable future collaborations to develop better ways of working together. The challenges of interdisciplinary work are numerous and should not be underestimated when designing and costing projects. These challenges mean an added importance is placed on good project planning and management from the outset. Use of the BASICS checklist when developing and implementing interdisciplinary projects may help to avoid some of the potential pitfalls of interdisciplinary work.

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Conflict of interest declaration

Lucy Gavens, Jane McLeod, John Holmes, Petra Meier, Emma Hock, and Maria Neumann have no competing interests. Gerhard Bühringer declares no conflict of interest in reference to the alcohol, tobacco and pharmaceutical industry, but has received unrestricted research grants from the public and commercial gaming industry. Anne Lingford-Hughes received grants and honoraria from Lundbeck paid into University accounts during the conduct of the study.

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