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SPECIAL ISSUE • Creativity and co-production

research

Improving knowledge mobilisation in healthcare: a qualitative exploration of creative co-design methods

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Background: Co-production, co-creation and co-design are increasingly used in healthcare research knowledge mobilisation. These methods have grown in popularity and the broad range of approaches are often used without any formal evaluation. The challenges to using these approaches are well reported yet there is little evidence on how to overcome them or how they work. This study evaluates 'creative co-design', a design-led, solutions-focused process developed specifically as a means to mobilise knowledge in healthcare.

Aims and objectives: To investigate the impact of creative co-design on the knowledge mobilisation process. To understand how it impacts on the application of research knowledge in routine clinical practice.

Methods: Semi-structured interviews were carried out with 20 participants from 14 projects. Data were analysed using the Framework approach. A workshop involving the first 10 participants was held prior to the final interviews and analysis.

Findings: The findings indicate that creative co-design successfully facilitates knowledge mobilisation in healthcare. This is represented by three interconnected themes: creative and visual; design-led; and creating the right conditions.

Discussion and conclusions: The themes highlight how the approach supports engagement and creates a safe space for knowledge sharing and synthesis in a non-hierarchical environment.

This study contributes important insights into how creative co-design can mobilise knowledge in healthcare. Further evaluation is warranted to help it develop into a recognised and effective method for research implementation and service improvement.

Key words co-production • creative co-design • knowledge mobilisation • health

Key messages

- Creative co-design was perceived to be a successful knowledge mobilisation approach.
- Creative and visual tools enhanced engagement and innovation.
- Involving a designer was key and is recommended in co-production projects.
- Creating a safe space balanced power and voice.

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Background

Getting evidence into practice is challenging. The evidence-based medicine and healthcare movement has tended to view this issue from a positivist perspective expecting that explicit scientific facts can be generated, transferred and used easily in practice (Greenhalgh, 2018). It is now widely acknowledged that this is not the case. Getting evidence used in healthcare practice and policy is not a rational, linear process, but a messy and complex task (Powell et al, 2017). For this reason there has been a shift in thinking about the way evidence should be produced (Greenhalgh et al, 2016; Powell et al, 2017). This has resulted in a move from 'mode 1' 'ivory tower' evidence production to 'mode 2' methods of knowledge generation (Greenhalgh et al, 2016). 'Mode 1' evidence is produced by academic institutions and published in academic journals largely for researchers and academics. In contrast, 'Mode 2' methods of knowledge generation are collaborative endeavours. Those who produce and those who will potentially use the findings work together to produce more relevant, useable and impactful knowledge (Greenhalgh et al, 2016; Locock and Boaz, 2019). In fact, Greenhalgh et al (2016) suggest that co-creative models of healthcare evidence production should include creative activities with strong links to design (Greenhalgh et al, 2016).

Knowledge mobilisation is the term that is now commonly used in healthcare research and service design in the UK. It describes the process of creating and sharing knowledge, in all its forms, to ensure the right evidence can then be applied in policy and practice (Powell et al, 2017; Ward, 2017). It can be a confusing concept and is often referred to as knowledge translation, encompassing other modes of knowledge sharing such as exchange and dissemination (www.nihr.ac.uk). In fact, there are an overwhelming number of knowledge mobilisation and implementation frameworks and theories (Nilsen, 2015; Ward, 2017) to base knowledge mobilisation and implementation endeavours on. For the purposes of this paper we describe knowledge mobilisation as a collaborative, interactive and context-specific endeavour (Langley et al, 2018; Melville-Richards et al, 2019), focusing on ensuring that the right knowledge

gets to the right people in the right format at the right time (Ward, 2017), to develop not only useful but usable knowledge that can be implemented into policy and practice (Beckett et al, 2018). When referring to knowledge and evidence we recognise and value the importance of all types of knowledge including experiential and practical knowledge, such as technical knowledge and practical wisdom, not just explicit, factual knowledge (Ward, 2017; Oliver et al, 2019). It is increasingly recognised that the insights and experiences of those on the giving and receiving end of evidence production are as important as those who are considered experts in a particular scientific field, that is, experts by experience (Sanders and Stappers, 2012; Palmer et al, 2019).

Co-productive activities have become popular in healthcare research and service improvement as a solution to the knowledge mobilisation problem, that is, getting evidence adopted into practice. However, in the literature co-production and co-design are presented in many guises. There is a lack of consensus regarding their meaning and how they are carried out (Locock and Boaz, 2019; Oliver et al, 2019). In healthcare the terms have been used to mean anything from co-producing research projects, involving healthcare users to define research questions, collecting research data, and dissemination of research findings (NIHR INVOLVE, 2019), to redesigning healthcare services and co-designing complex interventions (Locock and Boaz, 2019). Co-production and co-design can encompass a range of different methods. Activities, that are often described as co-production or co-design in the literature, range from those that stem from participatory design such as Experience Based Co-Design (EBCD) and Participatory Action Research (Bate and Robert, 2006), to those that have arisen from more traditional research methodologies such as focus groups, semi-structured interviews, and even simple consultation (Locock and Boaz, 2019). It is a crowded landscape with a lack of clear definitions, leading to what Williams et al (2020) have termed 'cobiquity' (Williams et al, 2020). What is clear is that levels of participation and engagement differ between the approaches, with many lacking the egalitarian ethos that genuine co-production and successful knowledge mobilisation requires (Williams et al, 2020). The most appropriate approach to achieve knowledge mobilisation should be based on a study's aims and stage of the process (Locock and Boaz, 2019; Oliver et al, 2019; Williams et al, 2020).

There are many challenges to co-production/design (Farr, 2018; Dimopoulos-Bick et al, 2019; Oliver et al, 2019; Palmer et al, 2019), which means that knowledge mobilisation may not always be successful. As well as the well-cited problems of time and resources there are also the challenges of getting a group of heterogeneous people working together collaboratively to create and share knowledge in order to achieve a shared goal (Oliver et al, 2019; Palmer et al, 2019). Researchers, healthcare professionals, and people living with health problems have a diverse set of needs, values and priorities (Farr, 2018; Oliver et al, 2019; Palmer et al, 2019). This means that managing group dynamics can be difficult. Inherent power imbalances and hierarchies that exist need to be addressed, otherwise sharing and valuing knowledge may not occur (Farr, 2018, Knowles et al, 2021). Only the voices of the most confident and outspoken may get heard, and group tension and interpersonal conflict can result which can be a barrier to knowledge mobilisation (Dimopoulos-Bick et al, 2019; Knowles et al, 2021; Oliver et al, 2019; Palmer et al, 2019). Some academics may not always have the right set of skills to facilitate co-productive activities for engaging participants effectively to achieve knowledge mobilisation. In addition, outputs from co-production/design projects can be regarded as lower quality than those deemed 'real' or 'pure' research

(Oliver et al, 2019). Yet it is argued here that the outcomes of those projects, which are developed in context, considering the complex systems in which they are to be used, means co-produced/designed outputs may be more likely to be implemented and knowledge mobilisation successfully achieved (Braithwaite et al, 2018).

Study context

The Translating Knowledge into Action (TK2A) theme, a unique team of clinical, social science, and design researchers, of the UK's National Institute of Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care Yorkshire and Humber (CLAHRC YH), have been interested in how participatory design methods can be used in healthcare to improve services and mobilise knowledge (Wolstenholme et al, 2019a). This culminated in the study presented here aiming to evaluate the TK2A themes approach as a knowledge mobilisation strategy in healthcare.

The TK2A theme team worked together to deliver their creative co-design approach in several healthcare knowledge mobilisation research and service improvement projects, over a five-year period. The design researcher had a background encompassing product, space, visual communication and model making, and brought their expertise in design thinking and practice to the team. Through their practice the team developed and refined the creative co-design process.

Creative co-design is an approach to mobilising evidence into policy and practice which is based on the Design Council's Double Diamond framework for innovation (Design Council, 2019). It utilises a variety of creative making activities and methods such as personas, storyboards, design prompts and prototyping, tailored to each individual project (Wolstenholme et al, 2019a). These carefully planned workshop activities aim to help capture the right knowledge and information in relation to the workshop's aims. Participants are guided through a series of structured and staged activities, including warm-up exercises unrelated to the topic at hand. These warmup activities aim to enable participants to gain familiarity with the methods and begin to feel at ease with each other (Langley et al, 2018). This process of solving unrelated problems together allows people to see the benefit of the approach before they begin working on, and thinking about, the 'real' issue specific to each project. The work is rooted in the participatory domain where 'genuine' participation and human centeredness are core (Simonsen, 2013). It is an egalitarian and utilitarian approach where all stakeholders' contributions are valued equally (Wolstenholme et al, 2019a). At its core is the concept that 'making' is considered a form of enquiry that enables tacit knowledge to surface (Langley et al, 2018), and creativity enables different ways of sharing experiences and ideas (Sanders and Stappers, 2012). All creative co-design projects involve those who give and receive healthcare knowledge/interventions, responding to the moral and pragmatic reasons for generating knowledge and changing processes (Wolstenholme et al, 2019b); that is, those who use services have a moral right to be involved in changes that affect them and are best placed to say what may or may not work. The creative co-design process ensures that context is considered, and the design researcher is involved at all stages of the process to facilitate the implementation of the co-designed knowledge products (Langley et al, 2018; Wolstenholme et al, 2019a).

This study evaluates the creative co-design approach used across 14 of the TK2A theme's healthcare projects, a mixture of service improvement and research knowledge

Table 1: Participant, project information and interview method

Participant ID	Main job role and title	Organisation	Health topic	Type of project	Type of knowledge	Interview method	Interview date	Interview length (minutes)	By whom
C1	Clinician Consultant Nurse (PhD)	NHS Foundaton Trust	Hepatitis C	NIHR CLAHRC funded Service improvement project	Research evidence	Face to face	October 2017	40	TS
C2	Clinician Consultant midwife (MSc)	NHS Foundation Trust	Obstetric theatre	NIHR CLAHRC funded Service improvement project	Research evidence	Face to face	November 2017	25	CG
C3	Clinician Consultant midwife (PhD)	NHS Foundation Trust	Obstetric theatre	NIHR CLAHRC funded Service improvement project	Research evidence	Face to face	November 2017	33	CG
C4	Clinician Social worker	NHS Foundation Trust	Hepatitis C	NIHR CLAHRC funded Service improvement project	Research evidence	Face to face	January 2018	24	CG
C5	Clinician Senior physiotherapist (MSc)	NHS Foundation Trust	Obesity and musculoskeletal care	Chartered Society of Physiotherapy funded Service improvement project	National Guidance	Telephone	April 2017	40	TS
C6	Clinician Physiotherapy manager (MSc)	NHS Foundation Trust	Obesity and musculoskeletal care	Chartered Society of Physiotherapy funded	National Guidance	Telephone	June 2018	66	CG
C7	Clinician Practice development nurse (MSc)	NHS Foundation Trust	Neutropenic sepsis	NIHR CLAHRC funded Service improvement project	Research Evidence	Face to face	July 2018	27	CG
C8	Clinician Specialist diabetes dietician (MSc)	NHS primary care services	Diabetes	NIHR CLAHRC funded Service improvement project	Research Evidence	Face to face	July 2018	36	TS

(*Continued*)

Table 1: (*Continued*)

Participant ID	Main job role and title	Organisation	Health topic	Type of project	Type of knowledge	Interview method	Interview date	Interview length (minutes)	By whom
C9	Clinician Senior project nurse (PhD)	NHS Foundation Trust	Neutropenic sepsis	NIHR CLAHRC funded Service improvement project	Research Evidence	Face to face	July 2018	41	CG
C10	Clinician Senior physiotherapist (MSc)	NHS Health and Social care services	Weight gain stroke	NIHR CLAHRC research capacity funding	Research Evidence	Telephone	August 2018	42	CG
A11	Academic Clinical research practitioner (MSc)	University	Safety netting	NIHR CLAHRC research capacity funding	Research Evidence	Telephone	November 2018	40	CG
C12	Clinician Specialist respiratory physiotherapist	NHS Foundation Trust	Pulmonary rehabilitation	NIHR CLAHRC funded Service improvement project	National guidance	Telephone	November 2018	40	CG
A13	Academic Senior research fellow (PhD)	University	Safety netting	NIHR CLAHRC research capacity funding	Research Evidence	Telephone	December 2018	45	CG
A14	Academic Research associate (PhD)	University	Autonomous virtual agent for people with Chronic Obstructive Pulmonary disease (COPD)	NIHR CLAHRC research capacity funding	Research Evidence	Face to face	January 2019	38	CG
C15	Clinician Enhanced role physiotherapist (NIHR internship)	NHS Foundation Trust	Low back pain	NIHR CLAHRC funded Service improvement project	National guidance	Face to face	January 2019	38	CG

(*Continued*)

Table 1: (*Continued*)

Participant ID	Main job role and title	Organisation	Health topic	Type of project	Type of knowledge	Interview method	Interview date	Interview length (minutes)	By whom
C16	Clinician Senior physiotherapist (MSc)	NHS Foundation Trust	Exercise after stroke	NIHR CLAHRC funded Service improvement project	Research Evidence	Telephone	February 2019	39	CG
C17	Clinician Senior occupational therapist/ Service improvement fellow	NHS Health and Social care Services	Mental health and physical activity	National Centre for Sport and Exercise Medicine funded service improvement project	National guidance	Telephone	February 2019	41	CG
C18	Clinician Respiratory consultant	NHS Foundation Trust	Malignant Pleural Effusion	NIHR CLAHRC and North West Lung Centre Charity and the Avon Mesothelioma Foundation funded research project	Research Evidence	Telephone	February 2019	35	CG
A19	Academic Research associate (PhD)	University	Patient Experience & Reflective Learning	NIHR research for patient benefit funded project	Research Evidence	Telephone	February 2019	51	CG
C20	Clinician Consultant neurologist	NHS Foundation Trust	Exercise after stroke	NIHR CLAHRC funded service improvement project	Research Evidence	Face to face	February 2019	37	CG

mobilisation projects covering varying healthcare topics (Table 1). It evaluates those activities rather than the individual projects themselves and addresses Metz et al's call to explore how creativity can influence evidence-into-practice (Metz et al, 2019). It is recognised that knowledge mobilisation as a process can be difficult to measure or quantify degrees of success (Ward, 2017). In this paper we used the interview participants' perceptions of whether knowledge was successfully generated, shared, transformed and embedded into usable, tangible products or services as the indicators for successful knowledge mobilisation. The outputs from the projects themselves were not formally evaluated.

The aim of the study was to:

1. Investigate the impact of creative co-design on the knowledge mobilisation process.
2. Establish the added value that the creative co-design approach might offer clinicians and academics when applying and adopting evidence to clinical practice and policy.

This paper presents the findings of qualitative interviews. The key themes that emerged in this study describe how the creative co-design methods enabled knowledge mobilisation and overcame some of the barriers to co-production described in the literature. (For further information regarding each individual project's creative co-design activities and outputs please see Wolstenholme et al, 2019a).

Methods

Design

This inductive, interpretivist qualitative evaluation (Bryman, 2008) used semi-structured interviews and adopted a modified case study approach, where each of the projects formed a case. The overarching aim was not to evaluate each project in sequence, but to explore and establish the combined 'added value' that the creative co-design approach provided. All participants gave written informed consent.

Participants and setting

A total of 20 participants were purposively recruited from 14 of the TK2A theme's projects. These were a mixture of clinicians and academics. They were either the project leads, or involved in the projects in a supportive role or as a participant in the workshops. No patient or public participants were recruited for this study. This was because we were particularly interested in the impact the methods had on clinicians and researchers, but also for pragmatic reasons, in particular time constraints, related to UK NHS ethics application. Sampling was inclusive to explore a broad range of perspectives from the different types of professionals involved in the various projects.

Data collection

Invitations to participate and participant information sheets were sent out via email. Participants signed a consent form prior to being interviewed. Interviews were carried

out between October 2017 and February 2019 and took place either face to face at the NIHR CLAHRC YH office, at the participant's workplace, or by telephone. An interview schedule that had been developed by TS and DW was used (see Appendix 1). TS, an experienced senior researcher, interviewed the first participant, while CG, an early career researcher, observed. TS then interviewed a further two participants and CG completed all other interviews. The interviews were recorded and transcribed verbatim by a university transcriber. Transcripts were anonymised and original recordings deleted.

After the first ten participants had been interviewed, prior to data saturation and to actively inform the initial thematic framework, they were invited to take part in a workshop. Six participants undertook activities that enabled them to share their experiences of their projects, and had the preliminary findings presented to them and discussed. The activities included a warm-up activity, 'Taboo', a three-minute presentation of each participant's project including an 'A-ha' moment, followed by sorting quotes into themes and feedback on the interview schedule. Following the workshop minor changes to the interview schedule were made before interviewing the next ten participants.

Data analysis

The data were analysed thematically by CG, with regular discussion with TS and AT. This was an inductive process and used elements of the framework technique (Ritchie and Lewis, 2003). This involved identifying themes grounded in the data and mapping them onto a framework developed from the data. The data were then compared to aid further refinement of the interpretation and analysis. QSR NVIVO 12 Pro was used to organise and code the data. The four stages of familiarisation, identification of a thematic framework, charting, and then mapping and theorising were carried out (Ritchie and Lewis, 2003). The activities carried out in the workshop informed the initial thematic framework, but participants were not involved any further in data analysis. See Figure 1 for data collection and anlysis process.

Results

Themes

The analysis of the data indicate that creative co-design helps facilitate knowledge creation, sharing and transformation in healthcare. This is demonstrated in the three interconnected themes, illustrating the different dimensions of creative co-design in knowledge mobilisation processes: a) creative and visual; b) design-led; and c) creating the right conditions. We also report on the overall impact of the creative co-design approach on the success or otherwise of the knowledge mobilisation process.

Creative and visual

The co-design activities were perceived as novel, informal and creative, encouraging engagement of all participants to work together from the beginning. Any initial reticence was overcome by using a series of tasks that developed skills and confidence through interactive and progressive activities.

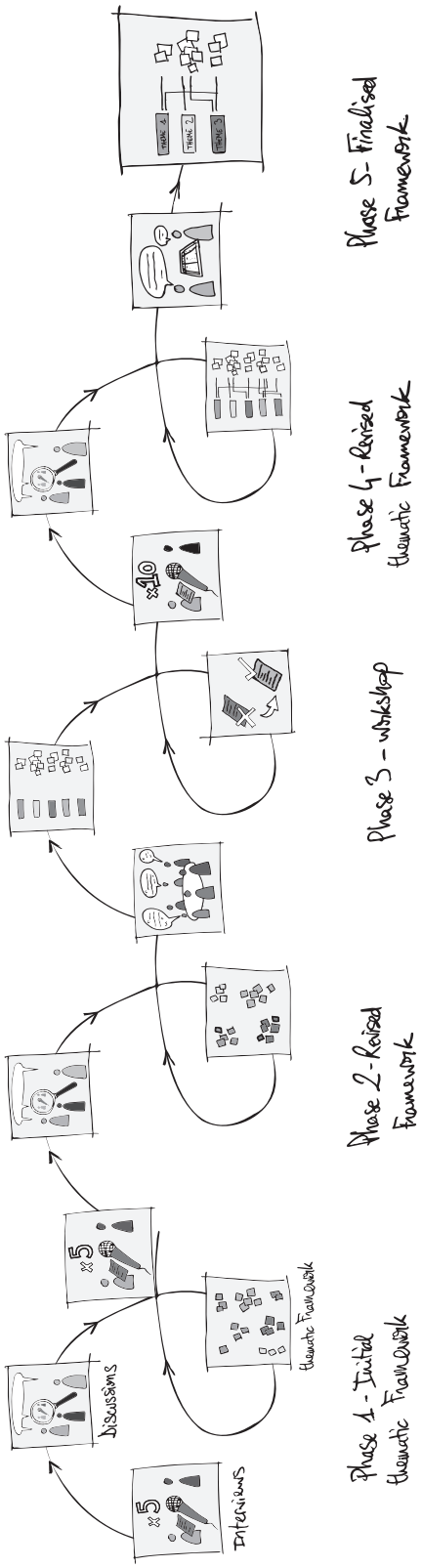

Figure 1: The data collection and analysis process

> 'Because people were so engaged in what they were doing and what they were talking about. It's one of those things where you go to a session and you think "oh I'm gonna have to do some silly games" then the next minute you're really enjoying it and really liking it, you're all a team and it's done exactly what it was meant to do'. (A11)

> 'There was a guy and to this day he still hasn't had treatment which shows you his anxiety… I remember I am sure he spoke quite openly within the bigger group. So for somebody like him to engage was amazing'. (C1)

Using visual prompts and encouraging participants to engage in more creative activities, such as drawing and 'making', appeared to readily stimulate thought and knowledge creation and sharing between those involved.

> 'The creativity and the different tools that were used just to get people talking and get them engaged were great. I don't think we could have done it without things like that'. (C12)

> 'Someone just quickly did something and everybody on the table liked it and made comments and I thought "oooh we might have something there" and we've got something, even if we'd completely dismiss it in the end, we've got something to talk about, they've got something to talk about'. (A11)

The creative activities were significantly different to workshop participants' typical day to day tasks. This enabled them to think and behave in different ways, unlocking different types of knowledge. The analysis demonstrates that this seemed to shift participants' way of thinking and ways of doing things differently.

> 'It was like wow this is interesting, this is a much better and different way of doing things, it makes them I think less inclined to just go with the normal way of doing things. Cos it really shows to them we're after something creative. So we don't want you to just say how we would normally do it'. (C15)

Several participants claimed that working visually, rather than via discussion, was particularly helpful in capturing more diverse knowledge from people, since participants could articulate their experiences and ideas with greater ease. Complex concepts could be illustrated through pictures or drawings rather than through the more restrictive idiom of language.

> 'You'd still be in word world if that makes sense? Whereas it sort of flagged like, get people to do it in a picture, they're thinking about it differently because they've got to draw it but also they're not in word world if that makes sense? You're kind of getting them to think slightly more creatively'. (C9)

All of the creative activities used in the workshops had an interactive and visual element to them. This appeared to reinforce engagement and the generation, sharing and transformation of knowledge, compared to other more traditional written ways of communication.

> '… because in a nutshell it really captured how people were really thinking about things. So using that more kind of creative, because if we'd done it in words it would've been more kind of like depressing, but actually for everyone to stand up with a picture and say like "well I feel like this" and the similarities between them all, it worked really, really well'. (C9)

Some of the interview participants considered the methods surprisingly successful and novel in enabling knowledge sharing, while others claimed that they did not feel confident in developing or using them.

> 'I mean no, a lot of those I hadn't come across, like using the cut-outs and things and making the story physical. I thought that worked really well. I was really impressed with how that worked'. (A19)

The novelty and distinct nature of the activities seemed to challenge participants' assumptions and open their eyes to other possibilities and alternative ways of doing things.

> 'It's about challenging cultural assumptions and that makes people feel uncomfortable. And if we can do that in a way that people don't feel threatened and it's a little bit entertaining and we can all have a laugh at ourselves…'. (C2)

> 'There was definitely an attitude of oh my goodness I've cancelled a clinic to make stuff with sticky tape. But those that stayed and engaged with the project really kind of saw the value of it in the long run. And I think that any participants that did disengage at that point regretted it by the end of the project because they could see the value of it'. (C5)

The creative and visual methods offered a unique way of knowledge sharing and generation that was unfamiliar and unconventional. In fact, some participants were sceptical towards its credibility. However, it was the distinct and novel nature of the method that seemed to quickly engage, even the sceptical participants.

Design-led

The participants considered the input of a design researcher to be invaluable, and without their input the benefits of the approach may not have been possible. The impact of their contribution was threefold. First, their expertise in developing the creative activities for each workshop. Second, their design perspective/ 'designerly' way of thinking was considered to help get diverse knowledge out of workshop participants. Third, their ability to visualise the knowledge gathered there and then, and embed it into physical prototypes.

> 'Yeah absolutely fantastic so I think X brought so much to the table obviously her experience and skill with kind of how she put these workshops together was absolutely fantastic. So she brought all the different tools. So I think without a designer it would have been very very difficult'. (C12)

> 'One of the members of your team was very good at drawing and animation. So being able to kind of visualise how things would look you know, because I think when you sit in kind of a room with lots of different people we all have an idea of what it was, and actually if someone can conceptualise and picture it vey quickly, it cements it. I liked Y's drawings a lot'. (C7)

The fact that the design researcher was able to turn participants' thoughts and ideas into something visible and tangible was extremely helpful. These visualisations could be in the form of a rough sketch during workshops or a basic physical prototype. They gave participants something to talk about but also something they were able to try out and adapt to see if it might work or not.

> 'But the thing that really sticks in my mind in the workshop was when somebody sort of drew something that's similar to what we've you know finally ended up with. And something started coming together. Cos it felt like there was a lot of discussion and a lot of work but we hadn't quite got to something concrete and then all of a sudden it was suddenly there on paper and it was that oh wow, yeah we've actually got something'. (A11)

The designers' input made participants feel that their contribution was valued and they had been listened to. This was achieved through visualisation by the designer of participants' experiences and ideas, and by being involved in the 'making' process together during the session:

> '… and that you know the things that they make it shows that they've been listened to and their ideas are there for them to see'. (C15)

> 'To be able to have your thoughts and your idea developed into ya know a good quality product that I think is something that's really ya know validating actually for people who are present and to actually be part of seeing how something, a change comes to fruition.' (C10)

This fostered a sense of pride and ownership over what was created and facilitated implementation and knowledge use in practice.

> 'From what I can gather people have said the patients involved loved it, they loved it. I don't wanna put words in their mouth, but the feedback that I got is that they felt really proud, they felt invested in it definitely, they felt a sense of ownership'. (A14)

> 'And we kept going through that until we came up with something that everybody within the stakeholders were happy with and happy to take ownership and move forward towards the implementation of it.' (C15)

To summarise, this theme demonstrates how the designer was able to capture people's experiences and ideas and commodify them into tangible, visible objects. This enabled participants to feel a sense of ownership of the final, fit for purpose, co-created outputs.

Creating the right conditions for knowledge mobilisation

The creative, visual and design-led approach supported the creation of an informal, open and honest environment. Interview participants perceived this to create a safe space for workshop participants to work together. This space enabled them to share their knowledge and experience without feeling judged and empowering some of those involved.

> 'I think it gives people permission to act in a different way. And we give them permission to do that. And they can ask ridiculous questions and people feel very safe in that environment. And they walk away feeling like they can do anything and anything's possible'. (C2)

Participation was fostered by being in a safe environment and the use of specific activities developed for each project. The activities created distance between the workshop participants and their own personal experiences which seemed to allow them to engage in a proactive manner.

> 'We all enjoyed building up a persona and thinking about that persona and I thought it was real strength that we were all looking at somebody objectively and not looking at one person in the room and their own personal experience'. (C17)

The data also suggests that some of the usual hierarchies that exist between healthcare professionals and between healthcare professionals and patients were broken down. The creative activities were described as fostering a feeling of inclusivity by making everyone in the room feel equal.

> 'I think really at the heart of the method is equality, everybody that participates, and I think that it's an extremely rich method in terms of participation. In equal participation and the opportunity for service users, carers and staff to come together and explore and discuss and create innovative ways of moving services forward.' (C10)

> 'Everyone just mucked in, because basically you know doing some of these activities just brought everyone to the same level, no one, you know is trained to think up something like that, something random but something fun you know. So it kind of brings everyone to the same place.' (C20)

This was particularly evident in the way some participants described how the power relationship specifically between patients and clinicians changed.

> 'Their relationship with patients is always very much in a clinical environment and everyone's got their set roles and expectations of how they should act and all the rest of it. Where here with this situation those barriers they've been taken down'. (A19)

It enabled one of the participating doctors to relate to the people they normally work with in a more personal way, seeing them as 'people' rather than just work colleagues or patients:

> 'and I was just sat next to you know Ruth rather than you know a patient with dementia or a stroke. I was just sat next to you know James rather than the therapist that was on the ward'. (C20)

This meant no-one was made to feel alienated, particularly regarding education, literacy and communication skills. Creative co-design activities allowed those people who are perhaps less confident or who often do not get the opportunity to express their views to do so.

> 'I think one of the things that we wanted, that we were conscious of, is that people's level of literacy potentially differing between people and how it was quite visual. So people were drawing things around the persona for their ideas of things that might help people access Hepatitis C treatment'. (C4)

The creation of a space, where everyone's knowledge and experiences were included, meant different perspectives were heard. The data implies that both sides of the story from patients, carers and staff were considered, understood and valued equally.

> 'So patients and staff working together to see obviously they often have different perspectives on things and don't realise the kind of the job role of the other person or the stress on that person. So it just brings all that together in order to get the best outcome for all really'. (C12)

For some of the clinical participants this was quite a liberating experience that allowed them to see the bigger picture.

> 'Certainly my perspective on what's important to patients has changed. It did open my eyes, yeah exactly that, to stuff that we didn't think would be important. I think there was one or two patients that said that this, they treated this condition, they felt that their pleural effusion was more important than the cancer and that I guess was really surprising for me'. (C18)

> 'It opened my eyes to what's possible and the kind of blinkered nature that I have as a clinician and the opportunities and possibilities that can arise out of this kind of collaborative working'. (C20)

In fact, by having visual and tangible artefacts for all participants to see, discuss, and try out meant any conflicts arising from their differing perspectives, values, or ideas could be managed. This removed any stigmas participants might have, meaning everyone could critically examine the object rather than someone's personal opinion, making it easier to work on the problem without causing offence.

> 'It worked really well in terms of giving you a thing to think about and see your ideas taken outside of you and put into a… but also as a way of reducing conflict between different sort of peoples bits of it, so that the argument that you were having was about an object not between each other'. (C1)

In summary, this theme shows how the conditions that creative co-design created, that is a safe and neutral space, gave participants greater freedom to express themselves. This discourse of 'community' and equity helped foster more productive and useful ideas that can be restricted with more rigid structures and processes. The three interconnected themes illustrate the different dimensions of creative co-design and the value they add to the knowledge mobilisation process. They demonstrate increased engagement in the co-design and knowledge mobilisation process and explicitly recognise all forms of knowledge. This could increase the quality of the outputs and the likelihood of being used in practice.

The overall impact of the creative co-design approach on knowledge mobilisation

Through the interviews all of the participants were asked to reflect on whether they felt the knowledge, they intended to mobilise, had been. They agreed that it had in varying degrees and provided various reasons to explain this:

1. The methods generated more ideas than 'traditional' approaches which allowed more participants to contribute to the knowledge mobilisation process:

   'I don't think the breadth of ideas that came out of the co-design meetings in terms of sort of you know interventions and things, I don't think that could have come out of interviews. That sort of idea generation, I don't think, I mean you could have sat around a table and just talked and thrown ideas around and brainstormed, but I think having that structured approach, did bring out more ideas than just you know brainstorming with a flipchart, would have done'. (A19)

2. Through allowing more people to contribute and generating more ideas new solutions were generated:

   '… and I'm hoping that actually what we'll end up with is something that will translate all that knowledge from the last couple of years of what we've found out from our patients, from our staff (yeah), into something new and dynamic you know'. (C7)

   '… but for me one of the successes is we didn't quite, we didn't achieve the aims in the way that we thought we were originally going to, we achieved them in a much better way and a much wider way you know a much more, you know systems based approach of it, so we came up with some, you know this is the sort of thing that we want, but the thing that we ended up with, was much more than we would we originally thought about and that's down I think to that, to the methodology, that creative co-production methodology I think it just expanded it outwards to look more wider'. (C15)

3. By focusing on blending knowledge and making tangible outputs:

   'Oh yeah hundred percent yeah completely I think, I'm really pleased with the methodology we selected and you know it led to some very good outputs,

yeah I think you succeeded in that. I think we achieved those goals and we've been able to now use that to you know to put together a prototype'. (C18)

' I think it'd still be one of those situations where there's bits of evidence out there, but no one's ever brought it all together and actually put something together practically that they can and could be used in an organisation, so erm err without this, I think it'd still be people not fumbling around, but trying to piece together bits of evidence from all over the place but this is just a nice way of bringing it all together'. (C16)

4. Achieving genuine co-production:

'I feel like it was true co-production. Success I suppose here at this stage is you know to have developed, actually have a prototype and an intervention there. I think importantly that where patients and health professionals and stakeholders have been actively involved, I think that's the key success and the strength as well and you know so, you know the kind of the co-design approach has certainly played a key role in that'. (A13)

Discussion

This paper demonstrates how creative co-design can facilitate successful knowledge mobilisation, that is, create, share, blend and transform knowledge into outcomes ready for application in healthcare. The three interconnecting themes: 'creative and visual', 'design-led' and 'creating the right conditions' for knowledge mobilisation support co-production/design and knowledge mobilisation to produce useful and usable outputs. They illustrate how knowledge mobilisation was achieved, in relation to the workshop tools and activities and to the designer involvement throughout all stages. Through the cumulative and synergistic process, a space was created that provided suitable conditions for participant engagement and successful co-production and thus knowledge mobilisation to take place. We argue that this process, with each factor influencing and enabling the next, demonstrates that all aspects of the creative co-design approach need to be in place. If not, the challenges to co-production/design are less likely to be overcome and successful knowledge mobilisation less likely to be achieved.

Benefits of being design-led

The literature shows that getting used to different and novel ways of working and thinking can be difficult, especially for professionals (Dimopoulos-Bick et al, 2019). Also it is acknowledged that planning and facilitating co-design requires a skill set that is distinct from the traditional academic and clinical environment (Oliver et al, 2019; Williams et al, 2020). In fact, facilitation of co-design is often inadequate. Designer input is largely adopted at the end of projects rather than at the beginning or throughout the co-design process (Farr, 2018; Dimopoulos-Bick et al, 2019). Yet it is known that less experienced facilitators may tend to stick to what they are familiar and comfortable with (Farr, 2018), which can decrease engagement and therefore negatively affect the co-design and knowledge mobilisation process. The data in

this study suggests that the staged, structured, design-led approach used in creative co-design can help with this.

Benefits of being creative and visual

The literature states that co-production should be an egalitarian endeavour (Williams et al, 2020). In fact it is the inherent power differences that exist in heterogeneous groups that pose one of the biggest challenges to successful co-production/design and knowledge mobilisation (Farr, 2018). Power inequalities can lead to poor engagement, reduced knowledge sharing, and a disparity between whose voice is heard and whose knowledge is valued. In this study the data demonstrates how the creative co-design methods overcame this challenge to create an environment where everyone felt equal and where their voices were heard and valued. In fact the use of creative and informal activities has been shown to encourage participant engagement and contribution in workshops, compared to more traditional methods (Farr, 2018; Knowles et al, 2021). This was facilitated through 'making' activities rather than through using language, which can limit and exclude some people, and helps to gain access to tacit knowledge, rather than explicit factual knowledge, which is often difficult to articulate with words (Langley et al, 2018). This can help people reconnect with their own values and move beyond the constraints of the bureaucratic processes they are used to working within (Farr, 2018). Bringing groups of people from different backgrounds together is difficult (Dimopoulos-Bick et al, 2019; Oliver et al, 2019). Patients, carers, clinicians, and managers have very different experiences, ideas, beliefs, and values. Sharing these different perspectives can be challenging and lead to conflict that can be difficult to manage (Oliver et al, 2019). Challenging people's beliefs can also be threatening (Hassenzahl, 2018). However, our findings suggest that creative methods, by producing visible and tangible objects that participants can try out, critique and adapt, can make it an unthreatening, liberating and empowering experience (Cooke et al, 2017; Batalden, 2018; Williams et al, 2020; Knowles et al, 2021).

Benefits of creating the right conditions

The design-led, creative and visual activities in this study promoted engagement and helped capture multiple perspectives. This is something that is not always achieved through traditional methods of feedback and data collection (Langley et al, 2018; Papoulias, 2018). However, this is an iterative and unpredictable process which can be challenging for those involved. It is known that trying new things can be scary and creative methods can seem silly and childish (Sanders and Stappers, 2012; Hassenzahl, 2018). For some people it may even feel like they are divesting their own expertise. It can be difficult for professionals and scientific experts to put aside their expertise and acknowledge the uncertainty of knowledge generation and production. This can make people feel vulnerable, which is a trait that is not nurtured in the traditional academic and medical fields (Batalden, 2018; Williams et al, 2020). The design-led creative and visual methods allow uncertainty and vulnerability to surface in subtle ways. Activities that seem nonsensical to start with are definitely not dealt with trivially (Hassenzahl, 2018). This helps create a space where people feel equal and all knowledge is valued. It is recognised that being fully engaged helps people

recognise their own vulnerabilities (Batalden, 2018), and the creative methods allow for this to happen.

Genuine co-production to enable knowledge mobilisation

It is evident from the data that elements from all three themes are central to knowledge mobilisation. In fact the co-production of not only useful knowledge but usable knowledge has been previously described as a virtuous cycle by Beckett et al (Beckett et al, 2018). It is evident from the results of this study that a type of virtuous cycle exists between the three themes identified. Removing any element from the themes could reduce the optimal conditions for co-production/design. For example, removing the designer and the tools, techniques, and expertise that they bring could negatively impact on participants' ability to operate, and explore alternative options and examine how objects can work in the real world. Without the development of tangible prototypes, participants may not feel that their ideas have been valued. This means outputs could lack ownership by participants and be less implementable. Likewise, without the structured and staggered, novel and informal creative activities, participants may not feel relaxed or develop trust with the techniques or other participants. This could affect the creation of the safe space to share knowledge within. If more traditional activities are used they may favour the more professional attitudes and knowledge of the group thus reinforcing hierarchies. In this paper we argue that it is the synergistic relationship between the elements of the three themes that creates the egalitarian, utilitarian and emancipatory conditions required for genuine engagement, co-production and improved knowledge mobilisation (see Figure 2).

Finally, knowledge mobilisation and co-production are complex tasks. The findings show that creative co-design can help navigate these complexities by making participants engage and face this complexity rather than trying to simplify it. It turns participants' collective knowledge into practical, tangible outputs, that is, usable knowledge for practice, which is more likely to be adopted than healthcare interventions designed by experts in the 'lab'. There are many ways of doing co-production. Creative co-design is therefore one approach that should be considered to help collective activities be truly co-productive. It enables the production of tangible, actionable outputs to aid successful knowledge mobilisation in healthcare.

Strengths and limitations

The lead author of this article conducted most of the interviews and was also part of the TK2A team. They were also involved in some of the co-production projects. This is a study strength as it provided rich insights into the creative co-design approach and the projects. However, participants' interview responses may have been influenced by the preexisting relationships with the interviewer during the creative co-design workshops. Acknowledging this as a potential weakness, TS, who was not involved in the planning or facilitation of workshops, carried out a small proportion of interviews to ensure that some of the interview discussions were not influenced by prior involvement of the research team in workshop planning activities. TS and AT were involved in the analysis where regular meetings were held to discuss the interpretation, credibility, and authenticity of the data.

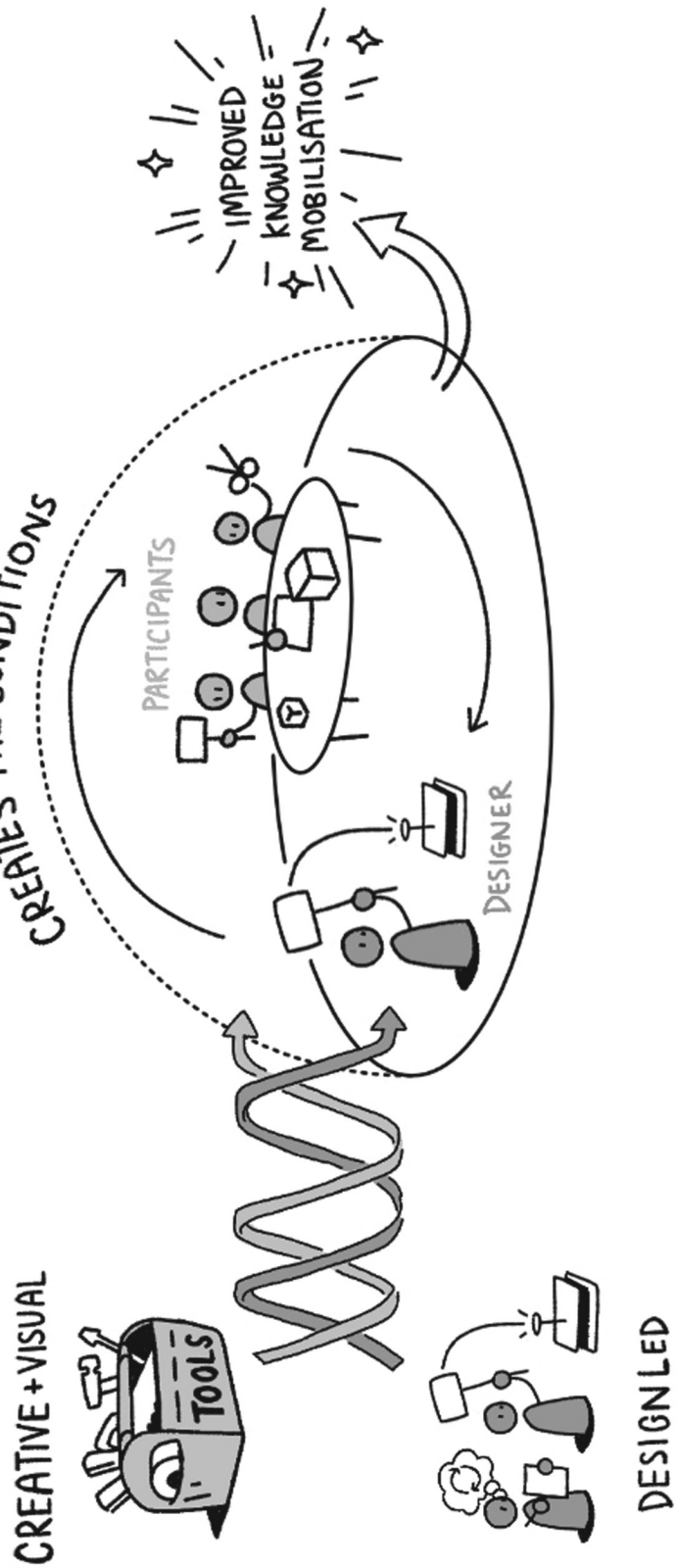

Figure 2: The three interconnected themes

The projects involved in this study covered a wide range of healthcare topics encompassing 14 projects. This enabled the impact of the creative co-design methods in knowledge mobilisation to be demonstrated across different contexts, clinical problems and groups of participants. It did, however, only focus on clinicians' and academics' perceived views of the methods to mobilise knowledge. Due to time and resource constraints, patients or carer participants were not interviewed. We recognise this as a weakness of the study and acknowledge that future evaluations of the methods need to include patient and carer insights and views.

Implications for researchers and clinicians

This study shows that using creative co-design can overcome some of the challenges of co-productive activities through producing practical, tangible and implementable outputs that are owned by those who co-created them. It describes how the key features of the themes: creative and visual, and design-led, can create the conditions that allow genuine engagement and egalitarian participation to occur, that is genuine co-production, and successful knowledge mobilisation. Designers are not routinely employed in healthcare research and improvement projects, and often not at the start of a research project. This study encourages researchers and clinicians to consider having design researchers as part of their project team from the outset. It highlights the benefits they can bring to knowledge mobilisation and co-production activities, in addition to helping develop researchers' and clinicians' skills in creative design-led methods. However, creative co-design is not without its own challenges – in particular, overcoming the scepticism of researchers who may not consider the approach to be aligned with the bedrock of science and the validity and reliability of other scientific methods.

Conclusions

This study contributes useful insights into how creative co-design can mobilise knowledge in healthcare. Its creative and visual, design-led approach helps to create the right conditions for successful co-production to take place, resulting in better knowledge sharing and synthesis. It offers a distinct contribution to the co-production field. The design-led facilitation helps to move beyond simple knowledge exchange. It turns ideas into tangible outputs, giving participants a sense of ownership, and produces more implementable solutions. Creative co-design assists in breaking down some of the barriers to doing successful co-production, making it a genuine co-productive method, not another 'cobiquity'. It offers researchers and clinicians the opportunity to work with designers throughout the course of their project and develop and learn important skills essential for genuine co-production and successful knowledge mobilisation. Further evaluation is warranted to help creative co-design develop into a recognised and effective method for research implementation and service improvement.

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Contributor statement
CG wrote the first draft and subsequent drafts of the manuscript, with comments from TS, RB, AT and DW. RB designed Figure 1. TS, DW and AT conceptualised the study and TS and DW designed the study. CG and TS undertook data collection. CG conducted data analysis and interpretation with contributions from TS and AT.

Conflict of interest
The authors declare that there is no conflict of interest.

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Appendix 1

TK2A: Topic Guide and Standard Evaluation Questions

Welcome and introduction

- Provide an overview of purpose, format and length of in-depth interview - topics to discuss, audio-recording, note taking where appropriate.

    - The purpose of these interviews are to capture and learn from the experiences of individuals undertaking knowledge mobilisation activities in collaboration with the TK2A theme of the NIHR CLAHRC YH. The interviews are not concerned with the evaluation of the project aims and outputs but in the impact of the methods that have been used in mobilising knowledge

- Ground rules of interview - for example, if you say any names we'll anonymise, if you need to we can stop/pause the interview (e.g. if they called away to clinical duties),
- Reinforce steps to preserve anonymity/confidentiality.
- Confirmation of consent. Emphasise that if they have any concerns with participation to let us know.
- Request to tape discussion.

Topic Guide

Divide into 5 core questions with prompts/subquestions

Key questions:-

1) Can you give us a short overview of the project?
    a) What was the aim
    b) The methods
    c) The outputs
2) What was the evidence/knowledge you were trying to implement?
    a) Research evidence
    b) Experiential knowledge
    c) Audit/service improvement data
3) Who was involved in the project?
    a) Type of stakeholders
    b) Patients and carers
    c) Front line staff
    d) academics
4) What was your choice of method of knowledge mobilisation?
    a) Coproduction, COM-B, Integrated KT, participatory methods, service improvement
    b) Why did you choose this

5) What was your experience of using this/these method/s
   a) What was positive and negative about the experience
   b) What would you have done differently
   c) What were the strengths and weaknesses of your choice of method (of knowledge mobilisation) in this case?
6) How do you think that the stakeholders of the project responded to your choice of methods
7) Would knowledge have been mobilised if these methods had not been adopted?
   a) Was the mobilisation of knowledge successful
   b) How did you define success in this case

Finally, the researcher would be more than happy to encourage any questions or comments you may have about the GRiP evaluation.