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Human-Centred Design Thinking: a novel tool for co-creation in physical activity research

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Abstract

Despite the substantial health benefits of physical activity across the lifespan, most youth and adults are insufficiently physically active. To combat this trend, numerous policies and interventions have been developed, many of which have had modest effects. The limited effectiveness of such interventions has been linked to the lack of or minimal community involvement. Consequently, there have been calls for solutions with greater community buy-in. In particular, there has been a rise in the use of co-creation in physical activity research, where stakeholders are engaged in understanding and defining problems and designing localised and contextual solutions. While there are many benefits to co-creation (e.g., collaboration, empowerment), there are also challenges, including the underreporting of co-creation approaches and methodologies used in physical activity research. We argue that human-centred design thinking can be a tool for approaching, complementing, and elevating co-creation. We discuss human-centred design thinking and offer strengths for how it can augment co-creation, such as through the Double Diamond model, toolkits and field guides, established activities, reporting guidelines, and asking different questions to spark social innovation. We also present a case study to showcase how human-centred design thinking as an approach to co-creation can look.

Keywords

design thinking; co-creation; physical activity; active living; co-design

Introduction

Physical activity (PA) is considered a “best buy” in public health due to its considerable health benefits (1). However, roughly 81% of youth and 28% of adults worldwide are insufficiently active (2, 3). To combat this trend, numerous health-promoting policies and interventions have been developed and evaluated, many with limited effectiveness for improving physical activity levels (4, 5, 6). The modest effects of previous interventions has been linked to the lack of community involvement in their development and implementation (7). Consequently, there has been growing interest in the development of more localised solutions that include community buy-in (7, 8).

Specifically, there has been a rise in the use of co-creation in public health and PA research, where stakeholders (e.g., beneficiaries) are active agents in shaping their health outcomes as opposed to passive contributors (9). This rise is evidenced by several recent studies exploring methods, characteristics, and frameworks for co-creation in public health and PA research (7, 9, 10, 11, 12, 13, 14, 15). Co-creation is defined as “engaging stakeholders in the process of understanding problems and designing contextually appropriate solutions” (16). Co-creation in PA research may empower communities to generate context-specific solutions (7), which may increase adherence and effectiveness of interventions (17). Additional benefits include collaboration, empowerment, communication, flexibility, impact, reflection, and efficiency (9).

However, co-creation is not without challenges, such as poor engagement, resource and practical constraints, and limited trust and transparency (9). Additionally, the way in which co-creation is approached and the methodologies used is not always reported, posing difficulties with replication and interpretation (9, 14). Given these challenges, this commentary proposes a tool for approaching and complementing co-creation: human-centred design thinking (HCDDT). This commentary will discuss HCDDT and its related components, whilst posing several questions and offering strengths of HCDDT to augment co-creation.

How might we start?

PA is complex and influenced by interactions with a range of individual characteristics and behaviours and economic, political, social, and physical determinants (18). There is a need for more human-centred, innovative, and effective approaches to better frame PA problems and develop meaningful solutions (19, 20). Given its collaborative, creative approach to problem-solving and solution generation, HCDDT offers a useful tool for co-creation (21, 22).

HCDDT draws on the values, motivations, and needs of communities to understand the challenges they face and develop best-fit solutions by utilising specific practices rooted in understanding the context (23, 24). HCDDT involves community engagement, iterating among distinct phases: empathise, define, ideate, prototype, and test (21). HCDDT offers certain mindsets, such as creative confidence, empathy, and learning from failure (25), as well as “designerly ways of knowing”, such as humanity, ingenuity, and imagination (i.e. human-centred design *thinking*) (26). Additionally, it provides a range of established practices and activities (20, 21, 27) for meaningful collaboration among communities, researchers (e.g., design academics), and stakeholders from a range of disciplines (i.e. human-centred design *doing*) (28, 29, 30).

While there are parallels between co-creation and HCDDT, they are not the same. For example, co-creation emphasises partnership, where problems are solved and solutions are developed with communities through shared ownership, power, and decision-making throughout projects (31). At the heart of problem-solving and solution generation in HCDDT is the need to empathise with the lived experience, desires, and needs of end-users (e.g., using dedicated activities like empathy maps to capture ones thoughts, feelings, and actions concerning a problem or solution) (31). In addition to collaborating with communities (a focus of co-creation) (14), HCDDT champions interdisciplinary collaboration with a range of stakeholders from various fields, academics, and in particular, design researchers (20, 22, 23, 32).

How might we gain greater clarity?

HCDT offers co-creation an iterative framework and a range of methods and activities corresponding to each HCDT phase. Recent reviews have explored theories used for co-creation in public health, and have identified that a range of frameworks are utilised, many of which are applied in broader aspects of public health research, such as the PRECEDE-PROCEED Model, Community Action Model, and Intervention System Theory (14, 15) and are not specific to co-creation, with the exception of the PRODUCES framework (7, 33). However, none of the studies in these reviews have included the Double Diamond model (34). This HCDT model depicts two bouts of divergent and convergent thinking (34). Unlike the traditional research process, which primarily investigates a problem and makes recommendations (i.e., only working in the first diamond), the Double Diamond translates them into actionable solutions through ideating, prototyping and testing (second diamond). HCDT goes beyond the first diamond into the second diamond with iteration throughout and can therefore augment traditional research processes used in co-creation. Figure 1 presents an adapted Double Diamond model (21, 34).

Figure 1. Adapted Double Diamond model for the HCDT Process.

HCDT also includes a range of toolkits and field guides, produced by key bodies in design thinking (e.g., IDEO, Design Council) (21, 34), that offer agile, collaborative activities that can be used when co-creating (20, 27, 35). These HCDT resources offer ample tools and activities that can be utilised to empathise, define, ideate, prototype, and test during co-creation. As shown in Table 1, these activities can complement more common methods used in applied PA and public health research (20, 36). For example, popular methods used to understand the context or user need include observations, focus groups, interviews, and surveys (36), and design methods that could complement these may include personas, storytelling, participatory workshops, and user journey mapping, thereby elevating the insights gained through an empathetic lens and end-user collaboration (20). In addition to the established creative activities offered by HCDT, these toolkits and field guides include detailed, step-by-step instructions (21, 34), and if used by co-creators, provide specific

directions that can inform the planned co-creation activities and guide more detailed reporting of co-creation (32, 37). Moreover, the rapid prototyping and testing HCDT phases may complement co-creation by creating physical representations of a solution idea (prototype) that can be tested with end-users quickly for immediate feedback and then refined for enhancement before finalising. These HCDT hallmarks can be leveraged when co-creating to increase reach, efficacy, and adoption of PA solutions or interventions (38). There are also detailed reporting guidelines for HCDT in health research (39), which may support the clearer reporting of co-creation (20, 40).

How might we foster innovation?

The use of HCDT to guide the co-creation process may spark greater innovation through its different approaches and solutions derived (9). Common co-creation and research processes include focus groups, interviews, surveys, workshops, and observations (36). HCDT offers additional design activities and practices that can supplement common co-creation methods (Table 1).

Moreover, HCDT can be used to spark social innovation, which has been characterised as a “novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals” (41). Thus, HCDT as an approach to co-creation may support the creation of social innovation in PA research where novel solutions are developed, moving beyond more traditional interventions. This sets HCDT apart from co-creation given that co-creation may be used to generate and adapt traditional evidence-based solutions so that they are tailored for different populations or contexts. With HCDT, the process may lead to generating an entirely different and novel solution that varies from conventional interventions.

A way that HCDT may ignite these novel solutions in co-creation is that it can invite different questions. For example, within PA research, there is a recognition that the built environment can influence PA participation (18), and studies have recently been exploring ways of optimising parks to entice people to visit for PA as a means of enhancing population health. In these studies, the

questions are often framed as “what do you (dis)like in a park?” or “what park features encourage you to be active in the park?” (42). These questions both direct and contain participants’ thinking to be focused on physical characteristics of parks. HCDT, however, invites us to challenge such parameters and implicit constraints people may apply (e.g., to park design) by asking different questions. If we are striving for novel solutions, then this requires probing beyond preconceived notions (e.g., of parks) by asking about values, emotions, and attitudes. An example of this is seen in a recent study that used HCDT to reimagine park design. Example questions asked included “how do you want to feel in a park?” and “what do parks represent to you?” (43). Through this process, participants were invited to consider other contexts of parks beyond uses for PA, and the questions sparked novel ideas that were not limited to the physical (re)planning of parks.

How can HCDT as an approach to co-creation look?

Here is a case study that used HCDT to co-create a remote heart monitoring and behaviour support program (including PA) for people with cardiovascular disease, *SmartHeart* (44).

To *EMPATHISE*, in-depth interviews were conducted with people living with heart failure (45) to better understand their lived experiences in the community and the self-care strategies they employed. This involved empathetic engagement through deep listening in the interviews to understand their problems, whilst exploring their feelings, thoughts, actions, strengths, and pains (24, 46). This HCDT-driven focus on exploring people’s needs, emotions, and values augments traditional interview processes (20). It also provided important contextualised information into how people with heart failure self-care (e.g., undertake physical activity) and that promoting empowerment and social connections may help in supporting self-care. This empathetic understanding then guided all subsequent phases and HCDT activities in the intervention development process.

To *DEFINE*, in-depth interviews were conducted with healthcare providers (47) to understand the root causes of challenges with managing heart failure for people living with disease, which informed problem statements. Problem statements are an established HCDT activity that can be used to ensure the “right” problem that addresses the underlying contributors of a problem rather than the “symptoms” is solved (21) and to enable different questions to be addressed in the intervention development that are guided by end-users (as opposed to researchers) and spark novel ideas during ideation.

To *IDEATE*, a Delphi survey with a range of healthcare providers with experience caring for people with heart failure (e.g., general practitioners, nurses) was administered to identify consensus-based recommendations for potential intervention features for *SmartHeart* (48). To further *IDEATE*, a scoping review of existing smart health systems was conducted (49), which helped identify features and spark initial ideas for the *SmartHeart* system. The review also helped identify data collection, personalisation, behavior change, and mode of delivery features of similar interventions, which could be incorporated into a prototype. To further understand the needs and potential components and features for *SmartHeart* from the user perspective, co-creation workshops with individuals living with heart failure and their caregivers (50) were run to identify key features required to empower them to self-care through PA. These workshops with end-users and design experts involved creative ideation activities to brainstorm innovative components of the *SmartHeart* system.

Building upon the intervention brainstorming, the *SmartHeart PROTOTYPE* was developed via a series of co-creation workshops. Four workshops with healthcare providers were conducted to determine how the system would work in practice and to refine the initial prototype (51). Additional workshops were conducted with people with heart failure to inform the user-facing features, and optimise the overall design look, feel, and navigation. During these workshops, participants discussed their ideas for the proposed *SmartHeart* system in subgroups and then sketched their ideas for intervention concepts. This activity was inspired by paper prototyping, and each paper prototype

was presented back to the larger group for discussion. During workshops, barriers to self-care were discussed and ideas for how *SmartHeart* could address those barriers were identified. This involved using icon cards depicting everyday objects as stimuli to discuss solutions to each barrier and invite different questions and perspectives. Participants selected relevant cards and explored how they could be integrated into intervention designs. A summary of the previous ideas generated were presented for further feedback and additional ideation, where participants were encouraged to write or draw their ideas on paper, which was then placed in a centrally visible location. An outcome of these workshops was the paper prototypes that outlined the key features and functions for *SmartHeart* rather than contextualising “off the shelf” solutions. Guided by the HCDT principle of iteration (21), initial participant feedback helped iterate the system to improve system on-boarding, app performance, and data visualisation elements prior to testing.

To *TEST SmartHeart*, an eight-week pilot study was conducted to determine the usability of the system and resolve technical issues. To ensure the intervention aligned with end-users’ needs and contexts, participants provided feedback on the *SmartHeart* prototype during testing. Exit interviews were also conducted, with surveys used to determine acceptability and usability of *SmartHeart*.

Following this usability study, changes to the *SmartHeart* platform were made based on feedback from end users (people with heart failure and heart failure nurses), such as modifying the conversational agent to include a chatbot feature. To support uptake, system-level changes included making improvements to the healthcare provider portal to better visualise users’ data, and to align *SmartHeart* with the broader clinical practice and policy system. HCDT can support systems thinking (52), and this example showcases how broader systems approaches were applied to increase the potential successful uptake of this intervention through meaningful participation with stakeholders, whilst accounting for contextual and systemic factors (14, 53). A multi-site randomised controlled trial is currently underway to evaluate the effects of *SmartHeart* in clinical practice and policy systems.

205 **Conclusion**

206 While co-creation in PA research offers significant benefits, the integration of an HCDT framework
207 and tools can guide co-creation. HCDT leverages the empowering strengths of co-creation, while
208 offering opportunities for iterative refinement (32). By inviting different questions, HCDT harnesses
209 diverse perspectives about the PA experience. Through an empathetic approach, HCDT offers a
210 medley of activities to define contextual needs and derive novel solutions to enhance the
211 effectiveness of initiatives aimed at increasing PA.

212

213

214 **List of abbreviations:**

215 HCDT: human-centred design thinking

216 PA: Physical Activity

217

218 **Declarations:**

219 **Ethics approval and consent to participate:**

220 Not applicable

221 **Consent for publication:**

222 Not applicable

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232 ER drafted the full manuscript. RM drafted the case study. All authors contributed to each section of
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Table 1. Complementary HCDT Methods and Activities to Traditional Co-Creation Methods

HCDT Phase	Purpose	Co-creation Methods	HCDT Methods and Activities
Empathise	Understand the context	• Literature review • Observations • Delphi technique • Diary studies	• User personas • Storytelling • Experience mapping

		• Expert meetings or forums • Context assessments • Needs assessments • Surveys • Workshops	• Empathy maps • Empathy interviews • User journey maps • Story Share-and-Capture • User Shadowing • Stakeholder mapping • Walk a Mile Immersion • Experience Diagramming
Define	Determine the problem or stakeholder need	• Focus groups • Interviews • Delphi technique • Contextual inquiry • Observations • Critical incident technique • Surveys • Workshops	• Use case scenarios • User personas • System mapping • 5 Why's • User journey maps • Rose, Bud, Thorn • Problem statement • Point of View framework
Ideate	Develop ideas	• Observations • Interviews • Focus groups • Surveys • Workshops	• How Might We • Round Robin Brainstorming • Quick Ideas • Brainstorming with constraints • Mash-ups • Crazy 8's • Creative Matrix
Prototype	Design solutions	• Workshops • Forums • Town meetings	• Concept pitch or poster • Storyboard • User narratives

			• Use case scenarios • Blueprint • Wizard of Oz Prototyping • Design Brief
Test	Test solutions	• Interviews • Observations • Focus groups • Ecological Momentary Assessment • Workshops • Rating processes • Surveys	• Simulations • Roleplay • Cognitive walkthrough • Heuristic evaluation • Participatory workshop • Feedback Capture Matrix • Dot Voting, • I Like, I Wish, What If • Empathy Probe