

Self Harmony: Rethinking Hackathons to Design and Critique Digital Technologies for Those Affected by Self-Harm

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ABSTRACT

In this paper we explore the opportunities, challenges and best practices around designing technologies for those affected by self-harm. Our work contributes to a growing HCI literature on mental health and wellbeing, as well as understandings of how to imbue appropriate value-sensitivity within the digital design process in these contexts. The first phase of our study was centred upon a hackathon during which teams of designers were asked to conceptualise and prototype digital products or services for those affected by self-harm. We discuss how value-sensitive actions and activities, including engagements with those with lived experiences of self-harm, were used to scaffold the conventional hackathon format in such a challenging context. Our approach was then extended through a series of critical engagements with clinicians and charity workers who provided appraisal of the prototypes and designs. Through analysis of these engagements we expose a number of design challenges for future HCI work that considers self-harm; moreover we offer insight into the role of stakeholder critiques in extending and rethinking hackathons as a design method in sensitive contexts.

Author Keywords

Self-harm; mental health and wellbeing; hackathons.

ACM Classification Keywords

H.5.m. Information interfaces and presentation: Miscellaneous;

INTRODUCTION

Good mental health and wellbeing is integral to quality of life, and enables people to cope with the complexities of everyday activities, to work productively, and to maintain fulfilling relationships [35]. In the UK, it is reported that one-in-four people experience at least one mental health

problem in any one year, and that one-in-six are experiencing a problem at any given time [23]. Statistics around mental health in younger people give further cause for concern: one-in-five young adults show signs of an eating disorder, and one-in-twelve deliberately harm themselves [38]. Self-harm describes the situation in which a person physically, and deliberately, injures or harms himself or herself without the intent of committing suicide. Self-harm is not a mental health condition in itself, but is symptomatic of other wellbeing issues, and often indicative of a range of co-morbid mental health challenges. Although frequently associated with younger people, self-harm can affect people of any age: estimates in the UK indicate that, in the population overall, 400 in 100,000 people are self-harming [22].

Though the human-computer interaction community has increasingly engaged with issues related to mental health and wellbeing, [2,12,30,31,34] there has been little research that has specifically considered the use of digital technologies for individuals affected by self-harm. Some previous research at the intersection of technology and self-harm (rather than mental health more generally), has been conducted outside of HCI, largely by healthcare practitioners and clinicians, whilst there has also been work relating to self-harm and eating disorders by researchers from public health, psychiatry, and youth studies [7, 25, 28]. Such work has mostly focused on explorations of online discussion in self-harm forums, and the analysis of self-harm content on social media platforms [7,9,10,13,16]. Owens et al [27] however highlight the need to involve service-users in digital intervention design in order to uncover and incorporate unmet needs into the design process. The nature of self-harm, lack of public awareness, and issues of social acceptability and taboo, however, mean traditional approaches to participatory healthcare design are particularly difficult to configure.

We set out to address these challenges through the design and execution of a research process which explicitly sought involvement from a variety of stakeholders involved with those affected by self-harm. These included service-providers and the wider public, as well as people with lived

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experience of self-harm. This two-stage process engaged these stakeholders in an exploration and critique of digital technologies within the context of self-harm, involving: (i) a hackathon to deliberately design for those affected by self-harm, and (ii) a series of stakeholder engagements in which participants critiqued concepts from the hackathon. We discuss the motivation, design and value-sensitive considerations of the hackathon, and how these informed the ideation and iteration of ideas for design and application of digital technologies. We then detail the stakeholder critiques with service providers, and the process of the engagements in which we sought to unpack the feasibility, acceptability and potential of the concepts for users.

Our reflections on this fieldwork highlight key considerations for designing within the context of self-harm, including: (i) the necessity of considering the appropriateness of nuance or simplicity of technologies for different care pathways and the effect that responsibility-sharing via technology can have on a self-harmer's support network; and (ii) the tensions and discrepancies between the concerns of clinicians and charity workers when discussing the implications of technologies and self-harm. This work reveals important challenges for interaction design to address self-harm specifically, and offers insights into how extending and rethinking the hackathon process with stakeholder critiques is a valuable tool for design in sensitive settings more generally. Our wider contribution lies in the unique integration of Value Sensitive Design (VSD) approaches to conduct a hackathon in difficult contexts, and dissemination and synthesis of our experiences regarding the engagement of service providers outside of the hackathon as an integral part of a more inclusive, considered, and longitudinal design process.

BACKGROUND

Self-harm is usually considered to be a way of expressing emotional distress, creating a sense of control, or escaping traumatic memories. It encompasses behaviors ranging from cutting, excessively exercising, punching or hitting oneself, misuse of alcohol or drugs, and eating disorders (ED) [22]. Self-harm is typically symptomatic of other mental health issues, including depression, anxiety, or borderline personality disorder (BPD). The conventional form of treatment or intervention that is decided for those who self-harm very much depends upon an individual's own reasons for self-harming. Treatment can include Cognitive Behavioral Therapy (CBT) and prescription of anti-depressants or anti-psychotics. In extreme instances individuals might also be subjected to a compulsory legal order committing them to a psychiatric hospital.

Self-harmers have been finding ways to connect with one another and share their experiences. This experience-sharing is mostly occurring through social media platforms like Tumblr, Twitter and Instagram, but also through mental health and self-harm apps that facilitate talking, such as 7 Cups of Tea [1] and Happier [14]. Whilst some of these

apps engender mutual support and reinforce positive behaviors, many of the forums allow self-harm behaviors to be propagated by individuals through providing tips for harming and keeping the practice hidden. The current use of technology by self-harmers to connect with one another allows us to consider how the design of digital and social technologies can affect change in the lives of those experiencing self-harm.

Self-harm, mental health and HCI

The majority of academic work on computing and mental health behaviors in the past has taken a broad approach to the issue, often lacking the nuance that accurately reflects the complexity of human mood and behavior. There are three main areas of work in the HCI field in relation to mental health: 1) designing wearables in order to elicit behavioral signals, with a view to improve diagnosis, management and prevention of mental health issues; 2) creating online communities to facilitate support for those facing similar mental health issues; and 3) designing to foster positive mental health and wellbeing; developing factors like mindfulness and gratitude [8]. In the majority of research at the intersection of HCI and mental health, the mental illness is foregrounded, and the experience of the individual is largely overlooked.

Engagement by the HCI community with self-harm is limited. If we use a wider definition of self-harm, however, then there is work that considers eating disorders (EDs) and online communities [28, 29]. Systematic reviews of social media in these contexts identify both the beneficial and detrimental effects for young people discussing deliberate self-harm and ED [7,10,13]. For many individuals, online platforms can provide a sense of community and facilitate the support necessary to help and guide those experiencing self-harm [15, 29]. However, Chancellor et al [10] explore the detrimental nature of lexical variations on moderated hashtags in pro-ED communities, and Pater et al [28] discuss the ways in which online ED communities misappropriate technology for negative health purposes. Related work highlights the value of anonymous online discussion for those that self-harm, and the importance of health professionals understanding this value, despite the perceived detrimental effects on individuals' behavior [15]. The significance of involving both service providers and service users in a critical and sensitive dialogue about the design of self-harm interventions was also identified [27], but is often overlooked.

Hackathons

An increasingly popular approach to innovation that involves co-creation with stakeholders is to use open design, and maker, events, such as hackathons. [3]. This is particularly true for the use of issue-oriented problems – events focused on finding ‘solutions’ to social concerns – which have been widely deployed by advocates of civic technology innovation, but also as a means for traditionally remote or conservative institutions to engage (or be seen to

engage) with the wider public. However, as an instrumental or social phenomena they are still largely underexplored. Indeed, while Trainer et al. [36] consider the trade-off between the value to participants of social tie formation with technical achievement, Lodato & Di Salvo understand them simply as “events which draw together various people, objects, and resources, for the purpose of articulating issues, as a kind of material participation” [18].

Hackathons in Sensitive Contexts

An increase in the interest of hackathons as a design thinking method has seen some organizers turn towards challenging or difficult topics. Health-related hackathons have gained significant attention: MIT Hacking Medicine [24], MedHacks 2.0 [21] and LiftOff Health [17] have all used hackathons to explore the intersection of technology and health with a view to transforming healthcare provision. Empowerment of refugees, health technologies in resource-limited settings, and homelessness are just a few examples of the sensitive areas that hackathons are addressing. Despite the increasing popularity of hackathon events, they have been criticized for their transient nature. Often the end of the event signals the dispersion of ideas, concepts and publics. Mantzavinou and Ranger [19] acknowledge that hackathons can generate short-lived excitement but lack a way to find sustainable solutions that create real impact. They understand hackathons as a ‘launching point’ to inspire further work and collaboration, and we endeavored to ensure that our hackathon was a launching point, as opposed to a fleeting event.

The sensitivity of the topics previously mentioned frequently makes hackathons *prosocial* events. While some hackathon participants are motivated by competition, demonstrating skills, or meeting future employers, other attendees exhibit altruistic behaviors, with the intention of creating digital tools to aid a particular community. In the context of our event, the majority of applicants were keen to disclose that they wished to attend in order to enhance their own understanding of self-harm, and work with those affected by it in order to create tools that would positively affect their futures. The notably prosocial nature of this event may have affected the design outcomes. It is worth noting that if the participants had been motivated by less altruistic reasons, the outputs may have been very different.

OVERALL STUDY DESIGN

Motivated by the lack of literature that considers how to design technologies for, and with, those affected by self-harm, we conducted a hackathon to foreground individuals who would be involved in the use of these technologies. Given that hackathons have been criticized for generating short-lived solutions, we sought to extend the conventional format to demonstrate that the event itself can be imagined as the beginning of a more powerful design process.

Our approach was influenced by elements of VSD that emphasize the ethical values of direct and indirect stakeholders in the design process. This approach to ethics

and technology considers that the outcomes of design processes are value-laden and that we should situate moral questions at the beginning of the design process. VSD advocates that designers identify stakeholders in the conceptual phase, how their values might be impacted by the technology, and subsequently involve these stakeholders in the research and technical phases of a design process [6]. We endeavored to do this by holding engagements with those who had experience of self-harm throughout the entire research process of this study, and incorporated their life experiences and suggestions into our overall study design. Self-harm is a particularly sensitive topic due to the stigmatization of the term and practice, coupled with its psychiatric connotations [9]. The juxtaposition of a collaborative environment and the sensitive nature of self-harm made for a particularly challenging setting. Therefore, preceding the event we met with charity workers, and individuals who had experienced self-harm, and discussed the challenges and ethical considerations of the event. Guest speakers, timetable and resources were also set through these engagements. These sense-checking activities allowed us to ensure that the event would be run in a sensitive manner. It was our goal to engage end-user stakeholders in the design process at the hackathon, and then service providers in a conversation that would surface design challenges for HCI, but also for the implications of service provision in this context.

In the next section we will discuss how, through value-sensitive activities, we carefully reconfigured the conventional hackathon format to account for the sensitivities of our participants. We outline a detailed description of the hackathon we coordinated, including the idea generation, expert feedback, and documentation of the concepts. Then we describe the digital designs that 7 teams produced, explaining the concepts, motivations, and imagined users. Following this, we will outline the process of the stakeholder critiques and findings from these critical discussions. We conclude with interaction design challenges for self-harm, and insights into the valuable role of stakeholder critiques in the reconfiguration of hackathons in sensitive and challenging contexts.

PHASE ONE: THE HACKATHON

We approached the design of Self Harmony, our hackathon, as an opportunity to bring together communities who would not usually collaborate on technology creation within the context of self-harm. We endeavored to create a safe but structured space in which there was a unique opportunity to work in collaboration with a diverse community; an environment in which engagement with technology could be used to provide digital solutions in a particularly sensitive and challenging context.

Participant Recruitment

As a university based event, we particularly targeted attendees from the student body (approx. 20,000 undergraduate and postgraduate students), the local

healthcare and voluntary sector, as well as the general public. Participants were recruited through local and national mailing lists and a website designed to promote the event. The website explained the threefold mission of the hackathon: 1) to aid in emotional coping, not only for those individuals who self-harm, but also their support networks; 2) to raise awareness of the term and practice, and dispel common misconceptions; and 3) to explore the concept of harm reduction. Potential participants were then able to browse the website and apply to attend the event through an online form. There were also advertisements within a local newspaper and posters distributed in university buildings and local public places. Participation was accepted on a first-come-first-served basis. All participants were offered compensation for travel costs, and food and refreshments were provided for the entire weekend.

45 participants attended the two-day (weekend) event. Participants' backgrounds varied widely, from senior medical trainees (n=4), health researchers (n=4), technologists (n=15), designers/makers (n=5), charity workers (n=5), members of the public (n=4), and individuals with lived experience of self-harm (n=8). Expert speakers were invited to inspire the participants and were chosen to cover a wide range of experiences and expertise within the context of mental health: a senior medical trainee with lived experience of self-harm, a professor of mental health, a mental health activist (and leader of a voluntary organization); and a facilitator of a self-injury support group.

The Event Itself

As the concept of Self Harmony was sensitive and unexplored territory for a hackathon, it was important that we guided the participants and discussed the scope and context of the issue so that conceptualization was appropriate. Given that self-harm is a behavior, rather than a mental disorder in itself, we aimed to provide participants with accounts of self-harm behaviors and experiences so that they could create actionable designs and prototypes. Inspiration packs attempted to guide the initial ideas for prototypes through the setting of three challenges:

1. How might we design a technology to be used by people who self-harm that will support them during their times of need?
2. How might we design a technology that will provide emotional support and guidance for the people around those that self-harm?
3. How might we design a technology that will improve our understanding of the patterns and causes of self-harm, on either a regional or national level?

These challenges directly related to our three themes of harm reduction, emotional support, and raising awareness, respectively. It was explained to participants that these challenges were set to guide them in a novel and unfamiliar area, and that it would be useful for teams to document how these challenges subsequently shaped their idea generation.

The first morning of the weekend was filled with context-setting talks and presentations from experts in self-harm who were there to provide inspiration for teams. Participants were given the opportunity to participate in a Q&A panel with all presenters and ask questions regarding the key challenges presented at the hackathon and the feasibility of ideas that participants raised. The presenters, along with others with lived experience of self-harm (n=3), a mental health charity worker (n=1), a technologist (n=1), an HCI academic (n=1), and a mental health researcher (n=1) acted as mentors throughout the hackathon. The mentors were asked to be present for the duration of the weekend in order to sense-check ideas with teams, and provide continuous critique to engender an iterative design process [23]. The regular feedback from the mentors was intended to constructively aid the teams throughout the process and ensure that teams sensitively engaged with the topic.

Documentation of the Event

The activity of participants at Self Harmony was captured in various ways in order to document the event and the various ideation processes that teams experienced and constructed. Teams were asked to use Slack in order to evidence aspects of their design concepts such as potential user base, inspiration, challenge addressed, and possible collaborators for development and deployment. Participants were encouraged to use Slack throughout the event to show how their ideas progressed as a team and outline what informed their ideation process. Furthermore, the keynote presentations, team feedback sessions and mentors' critiques were also captured on video. Selected elements of this documentation were later used in the presentation to stakeholders to engage them in a critical dialogue in order to reveal key concerns and strengths of the technologies.

Building a Safe Environment at the Hackathon

Full ethical approval was obtained from our internal institutional ethics committee. On application for Self Harmony, potential participants were emailed and informed that by attending the hackathon they would be agreeing to partake in a research study that was investigating the potential for digital technology in the context of self-harm. Participants were then able to submit an online form that specified if they consented to attending the hackathon and being part of the research study. Subsequently, on arrival at the event, all attendees (participants, mentors and presenters) was briefed and consented to participate in the research for the duration of the weekend. At the hackathon, participants were made to feel as comfortable as possible. There was a separate 'safe space' to the rear of the building that was for participants to relax and have discussions if they felt upset or triggered by anything brought up. On the second day this room was occupied by volunteers from a national charity who were there to provide emotional support for participants.

The configuration and design of the event was conducted bearing in mind the vulnerable population and the potential risk to attendees. For this reason, we held regular meetings with local mental health organizations in order to sense-check and ensure that we were creating a sensitive space that would facilitate innovation in a tactful and comfortable manner. It was in one of these meetings that an editor of a national mental health magazine stressed the importance of a space where participants could relax and speak to mental health professionals who were on hand to provide support when needed.

Design outcomes

The hackathon teams produced seven designs. In order to give an accurate sense of both the diversity of these, and also the commonalities, we briefly describe each below. As we explain later (Phase 2), we initially engaged stakeholder participants with all seven designs, but gravitated towards the three that solicited the most engaged responses.

Paperchain

Paperchain (Figure 1) is a mobile app that is based upon traditional chain analysis, which is a commonly used technique in dialectal behavior therapy (DBT). This form of therapy is particularly common with those that are experiencing self-harm. The app is a digital iteration of a paperchain, and allows users to track their moods and emotions by coloring in the chain. The app facilitates zooming in and out in order to gain perspective of how their moods have fluctuated over significant periods of time. It is also possible to share the digital paperchain with significant others and create codes between individuals that signify how someone is feeling at a particular time.

Digital Distraction Box

The Digital Distraction Box (Figure 2) is a physical, electronically locked box that holds self-harm tools. On top of the box is a digital screen that the user must interact with before the box will unlock. The screen can be configured in various ways by the user: it may display positive images, distraction games, and/or a way to audio record the reasons why somebody is self-harming, with the aim of retrospectively identifying triggers for the behavior. The box can also be configured so that it automatically unlocks after being shaken for a prolonged period of time. This concept was created not as a self-harm intervention, but to reduce the amount of harm caused.

Squeeze

Squeeze (Figure 3) is a crocheted, digital stress ball that is controlled by an Arduino single board microcontroller. As the user practices breathing techniques and mindfulness,



Figure 1. Paperchain App



Figure 2. Digital Distraction Box

they receive digital feedback from the stress ball. Squeeze was made to allow the user to feel an element of control over their own body and thoughts. The team identified the potential for communities to come together and create the Squeeze with a physical toolkit and an online repository.

Wavelength

When a user arrives at the web-based interface, they can decide whether to be a speaker or a listener. Speakers are presented with a pool of images from which they can choose three to represent how they are feeling. They are then able to annotate their chosen images to explain why they are relevant to their current mood. Once they have annotated their images they will be connected to a random listener in order to have a peer-to-peer conversation about how they are feeling.

Harmonize

An individual who self-harms writes a blog post and invites their friends and family to comment on it. To allow multiple perspectives to be shown, friends and family are able to blur out lines to indicate they did not know something was happening, comment, and highlight pieces to draw attention to them. If everyone that has been involved in the blog post feels happy with it, the blog can be uploaded to a website as an interactive blog. This concept is based on evidence that writing can improve outcomes of those self-harming. The team members saw this design as one that could be used as part of a family-

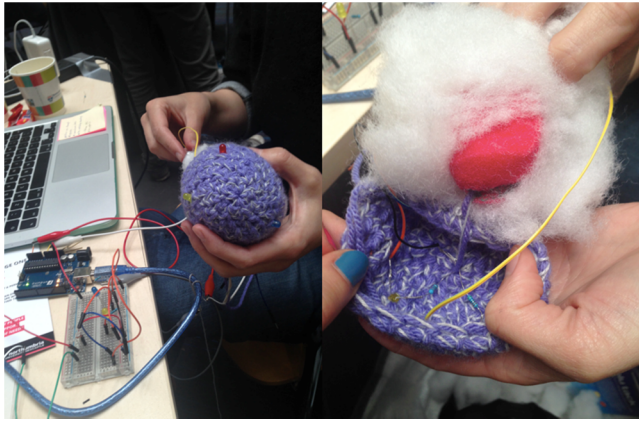


Figure 3. Squeeze Prototype.

based intervention, aimed at those who are nearing the end of a care pathway.

Speak Up

Speak Up is a web-based tool for the community of caregivers around those who self-harm. When a user is on the platform they are able to disclose whether they self-harm or if they know somebody who self-harms. They can then browse the platform and read information that other people have posted and select whether they found that information ‘helpful’ or ‘unhelpful’ to their situation. These selections will remain private, but will contribute to a personalized set of ratings for all of the posters on the forum. That way, when a user logs in to their account, they will be able to see whose posts they have previously found most helpful, and will have the opportunity to speak to them in a private conversation.

Good Vibes

Good Vibes is a mobile app and wearable that are intended to promote positivity and remind a user of what they like about themselves. A user can create a ‘support network’ where chosen loved ones will have the app and wearable. Everybody in the support network is able to input positive messages, comments and photos about themselves and the original user. If somebody is in crisis or feels that they need some positivity, they can squeeze their wearable that will send an alert to their network’s wearables and prompt them to input a positive message.

PHASE TWO: FOLLOW UP STAKEHOLDER CRITIQUES

In the second phase of the research process we used our documentation of the outputs of Self Harmony to engage stakeholders (statutory and voluntary service providers) in discussions as to their appropriateness and potential for positive impact (as digital ‘interventions’). We conducted stakeholder critiques with a range of individuals who worked in the area of mental health or self-harm specifically (see Table 1).

Each critique lasted approximately one hour and was held either at our research lab or the participants’ place of work. At each engagement a number of the seven concepts from

Self Harmony were presented to participants via various photos, video clips and other fragments of documentation collected at the event. The researcher began by presenting the outcomes to participants, explaining the digital concepts, their imagined users, and sources of inspiration in turn. Throughout this process, stakeholders were prompted to discuss the perceived usability and potential impact of each concept. Each stakeholder critique built upon the previous one, changing the order and length of the concept descriptions in order to scaffold a more critical dialogue.

Stakeholder participant	$n = x$
Student Wellbeing Services	3
Clinical Psychology Team	3
Third Sector Volunteers	3
Statutory Service Provider (and General Practitioner)	1
Self-Harm Nurse	1

Table 1 - Participant Information

It was explained to participants that the lead researcher had not been involved in the design or creation of the concepts, with the intention of engendering more critique. Participants were encouraged to be critical of each of the concepts in order to uncover the key concerns and implications of designing digital technologies in the context of self-harm.

Results

Although there were seven teams who conceptualized and prototyped seven different outcomes, here we present three outcomes that accurately represent the variety of outputs that were created. Furthermore, these three outcomes dominated the stakeholder discussions, engendering the most critique and therefore highlighting challenges for future work.

Digital Distraction Box

The Digital Distraction box was the most divisive concept out of the seven that were presented to stakeholders. Interestingly, it was also the concept that received the most affirmation from the participants at the hackathon who had lived experience of self-harm. These participants felt that it was the most useful concept, as although it was taking an interventionist approach, it did not ignore the fact that self-harm is an effective coping mechanism for many individuals.

In the stakeholder critiques the Digital Distraction Box sparked revealing conversations around the physicality of the box. Clinicians suggested that there was no need for a physical box when the behavioral techniques that the box prompted – such as distraction, reflection and trigger identification – are portable. The clinicians involved recognized that the box was best suited for self-harming individuals that used physical tools, but asserted that if the purpose of the concept is to create “barriers” to self-harming, these barriers can be created and recreated anywhere. One General Practitioner said, “*I don’t think you*

have to have... You don't have to carry your blade with you in a portable device all the time for it to be effective, if it was a blade". It was important for all of the clinicians that the behavioral techniques patients learned were accessible at all times, rather than the tools they were able to use to self-harm.

The team of clinical psychologists was disappointed with the physical box and also imagined a concept that was more portable. *"But I still really like the idea of having it on the phone".* The idea that the distractions could be portable for the individual, and on hand to negate the urge to self-harm, was crucial for the clinicians. The psychologists felt that their patients had acquired the skills to practice 'distraction' and 'grounding' techniques and those would be all that was necessary to stop the urge to self-harm. The psychologists then began to imagine how the portability of such a digital tool could be re-imagined in order to facilitate their ideas of what a 'good' digital tool would be. They imagined *"a little map, like a little treasure map, that would be good"*. This imagined treasure map would display various positive images and activities configured personally by the user, which would meaningfully delay the act of self-harming.

The psychology team explained that they would be unable to incorporate the digital box into the care pathway of their patients: *"Well there's no way we could use that here, for example. We take a real positive risk taking approach. As in people have access to their hair straighteners and razors and stuff, as and when they feel able to manage that safely"*. This revealed why the respondents were unable to identify the box as a useful tool for self-harmers. They later went on to explain that they are a recovery-focused program and that the emphasis is upon 'healthy coping mechanisms', and whilst recognizing that self-harming is a very real coping strategy for most individuals, they felt that it was an option that they no longer wanted to be available. For this particular group of psychologists, the discomfort evoked by the box is tied to their philosophy of care, but also where the individual is within their recovery pathway. As their care is situated within an individual's recovery pathway, their philosophy states that they should not have any access to tools they could harm themselves with, unless those involved in the recovery feel they are ready.

The physicality of the box seemed to evoke discomfort and unease in other clinicians, too. One therapist explained *"there's something that makes me feel a bit uncomfortable about someone putting them in a place with the specific purpose of accessing them [the tools]"*. The Student Wellbeing team considered the idea of keeping the tools in one place and creating hurdles to overcome before reaching them as 'reinforcing' and 'rewarding' self-harming behavior.

Interestingly, the issue of portability was not a key concern for a charity worker who had experience of working with young people who self-harmed. When discussing with a charity worker whether the box needed to be portable, he

explained that from his experience, the urge to self-harm only ever arises within an individual's home:

"I think also part of that is probably to do with I think people want to feel safe. I know it sounds silly but you know what I mean. People want to be safe when they are self-harming because it is not about ending their life. If they were to go by themselves in the middle of nowhere in some woods and self-harm probably I would say that is very, very unlikely to happen because there is a huge risk there. They don't want to end their life so why would they do it somewhere that is risky?"

This quotation, though not explicitly discussing the design concept, reveals and unpacks some common misconceptions about self-harming behavior. It is interesting that both a charity worker, and the self-harmers, could see the practical value of the box and share an understanding of the lived work of self-harm. Whilst it brought about unease in clinicians, because of the perceived risk to an individual; for those that self-harm, and the charity workers, it became obvious that it did not evoke the same discomfort. The charity worker and those with lived experience were able to see past the initial risks of self-harming behavior to the protective factors that the box facilitated. He explains that individuals who self-harm do not always do so as they intend to end their lives. People tend to self-harm in their homes, as they want to feel safe and secure. Although self-harming is widely considered a risky, dangerous behavior, for many individuals it is the opposite of that; it is a way to personalize, ground, and make them feel safe.

Paperchain

Paperchain seemed to be accepted more widely by clinicians throughout the engagements, as it was in line with the traditional methods that are encouraged to prompt behaviour change. This said, there were some key concerns that surfaced in relation to the digital paperchaining mobile app. All of the clinicians were concerned that the app may be too simplistic, or reductive, in that there are only eight different colours available for users to represent their moods or behaviours. This was made particularly obvious by a key informant involved in the commissioning of local health services: *"I think it might be too unsubtle, too reductionist... You can imagine my clinical psychologists might say, 'It's a bit too reductionist'"*. Psychologists felt that the app was not nuanced enough, as they wanted their patients to go further than mood acceptance and identification. They wanted the app to explore the nuances of the moods that led to self-harming and trigger identification, and the subsequent methods used to delay and distract from those urges.

This was echoed by the therapists from a student wellbeing service: *"I think we're not trying to encourage people to just change their mood. We're trying to encourage them to accept what their mood is. So there needs to be something there that either is looking at the triggers, or looking at the*

chain as it stands". There was a consensus that although the Paperchain app had the potential to be effective, in that its grounding in traditional methods of chain analysis was well-evidenced, it did not go far enough in its prompting of behavioural change. The clinicians approached about the app wanted there to be an iteration of the design that facilitated signposting, trigger identification and more colours in order to represent more nuanced moods.

Third sector volunteers were less concerned about the simplistic nature of the app and the implications for behaviour change, and focused on issues of accessibility and privacy. *"But what if you don't have a Smartphone or you don't have your own laptop? If you want to go on the internet you have to go on your mum's computer or whatever"*. Charity workers were concerned with a more encompassing critique arc about the technologies in that they required a laptop or smartphone. It was important that individuals who needed the app had access to their own technologies in order to maintain a sense of privacy when logging their behaviours. The demographic of individuals that mental health charities were working with often did not have access to these devices due to their economic status, which could lead to difficult conversations with family and friends.

The potential for a support network to be notified about behavior paperchains and the configuration and sharing of personal codes evoked concerns about responsibility and onus. It was felt that although support networks are an integral part of the recovery and journey of those self-harming, that their involvement should be approached with a certain amount of scepticism. One clinical psychologist observed *"what if the family haven't logged in or if they miss it and then there's a bit of a blame or, 'Well I did tell you because it's on my chain'"*. Whilst sharing codes had the potential to create meaningful and valuable relationships between loved ones, it could also mean that people are held accountable for not noticing or purposefully ignoring information input by those self-harming.

Squeeze

Overall, Squeeze evoked positive reactions from both clinicians and charity workers alike. Clinical psychologists were able to scaffold conversation around the digital stress ball by relating it back to the distress tolerance boxes that their patients used. This comparison to similar techniques used in-house facilitated an interesting discussion in which participants were able to reimagine the tangible and collaboratively design a new iteration of it: *"And maybe, as you go up, you could get a new thing that you could make on it as well, or stick on it? Or maybe you could sew on a star or something, when you get better?"*. This enthusiasm and shared imagining was typical of concepts that engendered little criticism, as respondents were able to concentrate on how to improve the designs, rather than explore their concerns for them.

This design was received so positively that three of the engagements were characterised by participants imagining different iterations of the tool that could be deployed at the same time: *"You might have two models, you might have them readymade, and then for those people who have enjoyed the readymade and want to do something for a friend, they might decide to knit one for a friend."* It was decided that the DIY nature of this concept may be anxiety-inducing for those individuals who are not creative and so there should be a readymade version, too. This off-the-shelf version would also mean that individuals who were not in the correct 'headspace' or did not have the time and effort to invest could still try it.

On the other hand, it was felt that there is something valuable about investing the time to personally create the Squeeze ball. One respondent said: *"Yes, it's a lot to ask but I think maybe if you made a thing out of it. Then if they've gone through building it then they've invested...they've got that ownership of it"*. The process of creating the tool itself, whilst practising mindfulness and breathing techniques, coupled with the therapy of making, was seen as a powerful process in itself.

DISCUSSION

Following the critical engagements with stakeholders in the context of self-harm, we offer several challenges for the design of digital technology and services in this area. These challenges relate to designing within a relationship of care, appropriately leveraging behavioral techniques, and striving for a common language between stakeholders in the design process.

Responsibility Sharing in Connected Networks of Care

Many of the design concepts were designed to facilitate conversations about self-harm across a support network. One of the challenges at the hackathon was to create a technology for the support network around a self-harming individual, given that caregivers often face conflicting demands, and can need their own form of support [5]. However, rather than designing *for* the support network, participants tended to only consider how the caregivers could *support* those self-harming. Several of the teams decided to design concepts that allowed friends and family to communicate with the self-harmers and support them throughout their experiences. This well-intentioned notion of responsibility-sharing caused concern within the stakeholder critiques. One clinician expressed worry for the potential recipients of the digital paperchain. It became apparent that poor wellbeing of one family member, coupled with the responsibility of care, could result in the poor mental health of another.

This concern regarding onus was mirrored in the discussions held by the team of clinical psychologists. Whilst acknowledging the necessity of mutual support for individuals experiencing mental health challenges, they also recognised the negative effects that caring for a self-harmer could have on oneself. The psychologists felt that if

somebody was experiencing low mood and was then constantly prompted to positively respond to somebody in distress, then their own mental health could suffer.

Furthermore, stakeholders were concerned not only about the fact that the mental health of the support network could be negatively affected, but also that an element of blame could occur. Clinicians were concerned that by involving loved ones in the self-harming individual's 'app network', there would be an element of 'blame' that would occur if friends or family did not respond. It became apparent that when designing for those affected by self-harm, we must consider not only the mental health of the individual, but also the mental health of the support network around the individual [11].

Baumgarten acknowledges that within ecologies of care – dementia in particular – often the caregiver will begin to suffer from mental health issues [5]. When designing within such a sensitive context, it is important that we consider how technology can allow individuals to support one another, without imposing an onus on caregivers and exacerbating any mental health issues. It is imperative that within HCI, there is a greater consideration of how technology can affect not only those who need care, but their caregivers. For inspiration concerning designing within caring relationships surrounding mental health challenges, we can turn to existing HCI work on caregivers for people with dementia. Wallace [37] used bespoke probes to empathically engage a couple living with dementia, and aid their design of digital jewellery to reflect upon their sense of personhood. In her work, she did not just focus on the person with dementia, but instead positioned her design response within the relationship between Gillian and John. When designing for such a sensitive context, we should ensure that we consider not only the person who is self-harming but also the caregiver's sense of self.

Nuance and Simplicity in Caring Technologies

Another concern that pervaded the stakeholder critiques was a perceived lack of nuance which stakeholders thought failed to represent the different behaviors and moods of the users. Particularly with Paperchain there was a sense that the eight different colors available were not varied enough to represent the infinite amount of moods an individual may experience in one day. The clinicians explained that they encouraged their patients to accept their moods by identifying and exploring their emotions in detail.

An individual involved in the commissioning of statutory health services echoed the importance of considering nuance in technologies for those experiencing mental health difficulties, but also acknowledged the benefit that some people may find in having simplistic tools to express their emotions. For some clinicians, it was more important that the users were able to express their emotions in any way, whether through words, visual images, or colors. The notion that an individual could identify and express the

moods, emotions and events that led to the act of self-harming was more important than *how* they are expressed, and to what degree.

When designing technologies for those who self-harm, it is imperative to consider how to *appropriately* leverage behavior change techniques, or whether they are even appropriate at all [4,20]. Although it would be appropriate within some care pathways to design an element of nuance into a digital technology, for others it is more important to facilitate a simplistic conversation. This speaks to the wider implication of designing not just for one community of those who self-harm, but multiple communities.

The notion of behavior change was fundamental for clinicians, and there is an opportunity for future work that explores how traditional methods can be individualized and therefore augmented by technology. However, behavior change should not be implemented without critical forethought given the sensitive context in which we are deploying these technologies.

Conflict in Design Processes

The language which was used, and the way in which stakeholders responded to the concepts from Self Harmony differed between the clinicians and the individuals who worked for mental health charities. The clinical psychologists and therapists from the wellbeing service were concerned about how the digital technologies prompted behavior change and facilitated 'barriers' to self-harming behaviors that would ultimately result in more positive mental health behaviors.

Through a process of shared reflection that made use of past experiences with patients who displayed self-harming behaviors, the clinicians were able to reveal their concerns for the Self Harmony concepts. The technologies that raised concerns were the ones that were felt to reinforce self-harming behaviors. The clinicians felt that the concepts should facilitate positive behavior change and enhance the traditional methods that are currently in practice. All of the clinicians explained that their desired iterations of the apps would work upon aiding trigger identification, mood reflection and distraction techniques.

The clinicians raised more concerns regarding the Self Harmony outputs than the charity sector respondents. The clinical psychologists and therapists used a language that engendered ideas of prevention and a creation of 'barriers' and 'hurdles' to the act of self-harming. Whilst there was a positivity regarding all of the designs, clinicians expressed concerns that some of the technologies had the potential to reinforce negative behaviors. Particularly with the 'Digital Distraction Box', there was a discomfort from healthcare providers that arose from the perceived 'accessibility' of self-harming tools that existed in the box. This discomfort was also present due to the perceived potential for the act of self-harming to be rewarded, or reinforced, by the tools within the box.

Whilst clinicians noted concerns regarding the implications of designing for a perceived vulnerable population, charity workers were worried about more practical issues, such as use in-situ and whether the target population would be able to gain access to the technologies. The conversations with the charities revealed something about the subjective realities of those affected by self-harm. It was acknowledged that despite the ‘undesirable’ and often dangerous nature of self-harm, for many individuals this is an acceptable and very real coping mechanism for processing and dealing with emotions.

Revealing stakeholder conflicts in this way means that HCI work can concentrate upon striving towards a shared language in the design of technologies that will affect different communities in the context of mental health. Our research identifies the presence of conflicting agendas within a complex, challenging and sensitive setting. There is a wider question here, when working with a number of diverse stakeholders, about how to ensure that no one voice is prioritized, and the design process is configured appropriately and equally by all.

Extending the Conventional Hackathon Format

Motivated by the criticism that conventional hackathons do not create lasting impact [19], and only generate short-lived attention, we extended and rethought the traditional hackathon format. By holding a series of engagements with stakeholders after the hackathon, we have been able to scaffold the conventional hackathon format so that expert stakeholders who could not attend the event were able to maintain a valuable involvement in appraising the design outcomes, and provide further ideas and imagine more appropriate design iterations for the self-harm context.

Despite the increasing popularity of hackathons, they still tend to attract a majority of technologists, and those with no technological expertise feel that they do not possess the skillset to attend and make valuable contributions to idea generation and prototype development [19]. By extending the hackathon with the stakeholder critiques, we ensured that non-technologists were able to have a tangible involvement in the design outcomes. Moreover, we were able to sustain an interest in the projects that resulted from the hackathon, which will lead to a reiteration of the outcomes with the expert stakeholders.

Furthermore, the critical engagements allow us to consider how we could reconfigure future hackathons in challenging and sensitive contexts. It is of utmost importance to involve those with lived experience in the design of the outcomes at the hackathon. However it is equally important to ensure that experts have the opportunity to engage in critiques of these outcomes from a later, more objective perspective, as they possess an expertise that can be seen as integral to how these design outcomes could be successfully integrated into self-harm care pathways. By engaging with a diverse set of expert stakeholders, we are able to imagine how design outcomes from hackathons can be appropriately redesigned

for different individuals and different care pathways within the context of self-harm. Appropriate consideration must be given to how the participation of stakeholders – including those who self-harm and healthcare practitioners – is scaffolded, and how their contributions are appropriately accounted for. Though some aspects of the hackathon could be considered ‘conventional’, the contribution of this work lies in the integration of VCD approaches of conducting a hackathon in a sensitive setting, and a subsequent engagement of practitioners, clinicians and users in a more inclusive, considered and longitudinal design process.

Our own future work will see the documentation from Self Harmony, and the critiques from stakeholders, inform a competition commissioning platform that will facilitate open sourcing ideas for designing and developing digital tools for mental health. The platform will facilitate an online conversation between individuals with lived experience of self-harm, software developers, and healthcare professionals, which will result in the proposal of ideas for apps, and the subsequent deployment of the winning app into the local community. Through this continued extension of the conventional hackathon format we strive for a greater level of inclusion in the design processes and the creation of sustainable digital tools to support mental health and wellbeing.

CONCLUSION

Motivated by existing literature, we configured and ran a hackathon to design technologies for those affected by self-harm. We extended the conventional hackathon format by holding a series of critical engagements where experts were asked to critique the design outcomes. Through an analysis of these engagements, we unpack key concerns and challenges for research in digital mental health that considers self-harm: responsibility-sharing in networks of care; nuance in caring technologies; stakeholder conflicts; and extending the conventional hackathon format. Moreover, we identify how rethinking and extending the conventional hackathon format can be a valuable design method in sensitive settings.

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