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Materialising Mental Health: Design Approaches for Creative Engagement with Intangible Experience

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Abstract

Can creative methods drawn from design research practice be leveraged to help people think about, express, and discuss their own mental health? Tackling communication hurdles around mental health is a societal challenge which creative methods of inquiry are well placed to address: where verbal expression alone fails, the affordances of multisensory tools and artefacts have potential to provide a language for expression, discussion and peer support, and to create collective pictures of a community's mental health. In this chapter, we introduce a multi-faceted exploration of how mental health issues can be materialised in individual and group contexts. Personalised Potions, Empathy Rock Garden, Emotional Modelling, and Lexicon of Feelings are four 'making' activities developed and facilitated by students at Carnegie Mellon University, Pennsylvania, USA. Each activity takes a unique approach to materialising emotions, using different material qualities and facilitation techniques, enabling varying levels of anonymity, synchronicity, and collaboration, but are united in their ability to create a safe space for externalisation of complex internal emotions. Our approach is centred on exploring participants'

making activities and the artefacts emerging: while acts of making may have therapeutic properties, our main interest is in observing the patterns, themes, metaphors, and material mappings which are produced.

Introduction

We are living in fraught times. According to research compiled by the Wellcome Trust (UK), 'one in four people will experience a mental health problem in any given year' and '75% of people with a mental health problem develop it before the age of 24' (Wellcome Trust, 2018). University students, in common with many people in high-pressure environments, can experience a broad range of mental health issues. At our institution, student mental health is a major challenge, with numerous working groups and initiatives dedicated to addressing it in different ways. As a society, we don't always have adequate ways of talking about mental health. Our experiences of mental health are our own, largely invisible and phenomenological, and describing and sharing them can mean using language that may seem imperfect for the task. Everything becomes a metaphor when the 'thing' itself cannot be seen. In interaction design research, some projects addressing mental health and wellbeing have sought to enable peer support, mobile-based applications, or investigated how social media use data can be used to investigate and understand mental health (de Choudhury, 2013), while other work has focused more on questions of how intangible, invisible inner states might be shared (e.g. the 'stakeholder tokens' of Yoo, 2018).

Although experiencing mental health challenges is universal, people communicate them in unique ways: some are very open about their personal struggles, and others are reticent. This could be part of individual personalities, but perhaps also for a host of other reasons, including sociocultural, gender, and environmental norms. The sharing of mental health issues itself can be seen as inappropriate or taboo, depending on cultural norms. In an often-competitive setting such as a university, this is no less true. Increasing numbers of students around the world report suffering mental health issues; under intense academic pressure, students may often lack the opportunity to address their mental health challenges in a constructive way and there is potentially a need for different approaches We therefore focus primarily on developing methods for tackling communication hurdles around mental health in an academic environment, but also explore how these methods might work in a public-facing setting.

Methodological approach

In this chapter, we introduce four exploratory activities which seek to address this materialisation and sharing of experiences through using physical materials: Personalized Potions, Empathy Rock Garden, Emotional Modelling, and Lexicon of Feelings. Developed by students for other students, in a university wellbeing context, the four projects took shape via an eight-week elective design studio course. Sixteen students from a variety of disciplinary specialisms,

undergraduates and graduates, from the USA and from international backgrounds, discussed and reflected on their own experiences of mental health, consulted with the university's Counselling and Psychological Services, and examined other projects tackling related aspects of this topic (e.g. Chang, 2018; Frick, 2015; Simpson, 2017). As we illustrate here, the projects were informally piloted with other students in public areas around campus, and in structured sessions with individual students. Our initial and primary focus has been working within the university community, and we report on, and discuss, our observations here. However, throughout the process we recognised wider opportunities for the role of physical materials in externalising and coping with mental health issues. Three of the projects were developed further to run a participatory workshop in a space dedicated to neurodiversity and mental health at the 2019 Mozilla Festival in London, UK, a technology industry community event, with a wider public audience. Our findings from the pilot studies with students, together with some insights from the Festival, are synthesised in this chapter, with the intention of demonstrating the potential of these kinds of creative methods to contribute to applications with broader social benefit.

Theoretical approach

Tversky (2015, p. 99) explores how throughout human history, people have found ways to externalise thought: from writing to drawing pictures, diagrams, and maps, to making models, even 'arrangements of sticks and stones and coffee cups'. These 'cognitive artifacts' support individual thinking and sensemaking, but also sharing, discussing, and thinking with others, and can include communicating, or materialising the way people think, feel, and understand. In 'research through design' and human-computer interaction research, and more widely in what are being termed innovative social research methods (Lupton, 2018), a variety of creative approaches are being developed which seek to help in this materialisation. Work on participatory design and facilitation processes often used in user experience design (commercially) or working with communities (in social design applications), may seem a long way from a health and wellbeing context. However, approaches such as data physicalisation (Thudt et al., 2018), metaphors (Lockton et al., 2019), building models (Fass, 2016, Ricketts and Lockton, 2019), drawing (Bowden et al., 2015), art therapy (Rosal, 2018), systemic design (Aguirre Ulloa and Paulsen, 2017, Rygh & Clatworthy, 2019), and synaesthesia research (Lee et al., 2019), all have something to offer as a way of capturing, expressing, and communicating the qualitative dimensions of people's experiences. By doing so, these methods make people's experiences palpable and enable discussion and peer support. They can also enable people to share 'what works' for them.

Figure 1: *(top)* A participant's Emotional Modelling construction representing their expression of anxiety and a range of related emotions; *(lower two images)* The recipe for one participant's Personalised Potion for 'any kind of relationship', worn with the potion itself on a lanyard, and student participants creating their Personalised Potions. More photos of the projects and participants' creations are available in a gallery at http://imaginari.es/mmh

Personalised Potions

Personalised Potions (Figure 1) set out to materialize mental health by asking participants to express what they feel, but in a playful and indirect way—asking what qualities they believe *they need*. We asked participants to think of a challenge they are currently facing in their life, and then create a "potion" that would help them tackle it. The experience of creating a potion was guided by facilitators, who encouraged participants to reflect on their current challenges, and to

better understand what are the qualities they will need to deal with their chosen challenge (and loosely quantify and compare how much of each might be needed: parallel in some ways to the concept of the 'psychogram' introduced by Matt Haig (2008)). After identifying a challenge, participants were asked to add ingredients into a vial, to make the potion. The facilitator asked them to create an "activation" phrase for the potion: like any good potion, it doesn't work without a phrase or an action to set it off. The purpose of the activation phrase was to identify a single incremental action that can help move someone closer towards their goal. The activity was free-form and individualised in subject. Participants could use the activity to address whatever aspect of their own mental health that they choose, however big or small. Although the personal challenges participants choose to address though the activity may be personally daunting, the physicalisation and structured language of the activity is purposely forward-thinking and positive, giving them an opportunity to express self-compassion, and to pause and reflect on what they need for their own well-being.

Design process

Several prototypes were created in the development of personalised potions, and the team iteratively tested with other students in order to learn to evoke the desired outcomes. Some of the materials we tested for this activity included pebbles, beads, moss, flowers, gravel and string. One early iteration provided participants with diverse materials, allowing them to interpret themselves what these materials symbolise. The task proved too difficult, diverting participants' focus to attempting to link material qualities to abstract qualities (an interesting area of research in itself, e.g. Aguirre Ulloa and Paulsen (2017)), instead of focusing on self-reflection.

In pilots with students, we also noticed that participants tended to use colourful materials that were easy to place in a vial, like beads. Thus, in the next iteration, we exchanged diverse materials to simple coloured sugar. Again, the different colours did not provide an instantly recognisable metaphor for abstract qualities, and participants mostly chose colours they liked aesthetically. As a result, we decided to label the sugar with predetermined qualities. When piloting, participants enjoyed having a relatively small set of qualities to choose from and were able to focus on their emotions. The final qualities the ingredients represented were: 'courage', 'compassion', 'trust', 'discipline', 'hope', 'honesty' and 'a secret ingredient'. The latter gave participants the chance to break out of the structure of the activity by identifying qualities that might apply to them as individuals. The final prototype therefore allowed them to focus on reflection, with enough participant input in the process that would make it feel personal. The additional step of an 'activation phrase' also seemed to have contributed to creating a personal connection. When the session was complete, the remaining levels of ingredients acted as an aggregate of participant sentiment—a kind of data physicalisation allowing us to observe overall trends within the community who participated. Notably, in our largest workshop with students, taking place shortly before the final exam period, 'discipline' was the most used ingredient.

Findings

Personalised Potions was staged in two locations on campus: in a student dorm, and in an administrative office. Thus, two diverse groups were encouraged to participate: The first group of participants were undergraduate students that lived on campus (young adults), and the second a group of university administrative workers, with a broad range of ages and backgrounds.

We found that both groups of academic participants expressed themselves with the physicality of the activity in many ways: (1) Some paid close attention to the quantity of each ingredient, adding precisely the quantity they needed ('...just a little bit of courage'); (2) some noticed the order of things, placing the ingredients in the order that they needed the abstract qualities; (3) others decided to shake the potion at the end to finalise it, while others thought a layered reminder would be helpful; (4) most participants were glad to be able to take their potion home, and noted that it would serve as a physical motivational artefact. Overall, we suggest that translating complex questions, such as 'What challenge are you currently facing?', or 'What is your biggest concern?' into physical and playful material helped participants open up, and be receptive to reflection. The physical aspects of the activity not only contributed a light-hearted environment, but also allowed participants to manipulate it in different ways to fit their personal needs. Finally, the material allowed participants to take the results of the activity with them as a physical reminder of the abstract qualities needed to support their wellbeing.

Some small adjustments were made for the staging at the Mozilla Festival. For one, lanyards were provided, and labels made more decorative so that participants could wear their potions while exploring the rest of the event. This form factor worked well alongside the festival name cards and encouraged other attendees to participate in the workshop. The most used ingredient at the end of the festival weekend was 'trust', which seems to fall in line with the broader theme of the festival, exploring technology's role in cultivating interpersonal interactions. Participants skewed approximately 10 years older than the average university participant, but enthusiasm and participation patterns were similar to the campus stagings, indicating that the activity was designed to maturity.

Emotional Modelling

Inspired by artists and designers who have endeavoured to create tools for expressing very personal and often sensitive information, including Benjamin Koslowski and Brendan Dawes at al's States of Mind (2015), our team developed a physical toolkit (Figure 1) that might support an individual in private self-reflection and the communication of intimate thoughts and feelings to another (should they choose to do so). The toolkit contains a set of solid objects and connectors, varying in colour, size and material, that participants use to construct a representation of their particular emotional experience.

Design Process

We began by exploring both 2-dimensional and 3-dimensional modes of expression. To test the potential of a 2D approach, we borrowed pieces from a mental modelling toolkit produced previously (Ricketts and Lockton, 2019), which included pieces of thick card stock cut into shapes commonly found in natural landscapes (such as trees, mountains and clouds). To test a 3D approach, we provided our participants with a set of craft supplies including clay, pipe cleaners of various sizes and colours, fluffy balls, wooden skewers, fabric and balloons. For both 2D and 3D activities, we asked each participant to create a visual representation of their emotional state.

In our discussions with participants following each activity, we found that while the collection of 3D materials afforded a great deal of freedom, many felt overwhelmed by the variety of materials provided. Conversely, the more limited palette provided by the 2D pieces enabled participants to focus their efforts and assign meaning to particular qualities of the various components. Seeing an opportunity to combine the most effective facets of each approach, we chose to pursue a hybrid of the two methods, producing a 3D tool with a restricted palette of elements. The final toolkit includes a set of geometric volumes in a monochromatic six-colour palette and simple material combinations. This included wood, felt, raw 3D-printed plastic, and weighted 3D-printed plastic which we finished to resemble stone. Within each shape we created a series of holes to accommodate two different types of connectors (wood and silicone rods) allowing participants to connect the objects together in a variety of ways.

Findings

While testing the final toolkit with 30 students as participants, as well as subsequently with 20 participants at the Mozilla Festival, we found that the limited palette of materials did, in fact, allow them to more readily assign meaning to specific characteristics, making it easier to communicate complex thoughts and feelings. This approach, combined with a clearly defined method of construction, effectively lowered the activity's barrier to entry. Participants required less instruction and showed an eagerness to start building much more quickly than in previous trials. As we had hoped, most participants had little or no trouble explaining their representations as they were able to clearly express their intent and meaning attributed to each component. Through this process of creation and discussion, common threads emerged in the ways certain materials were most often used (echoing the general findings of some other projects around emotions and materials). For example, many participants were drawn to the faux stone volumes to describe 'heavier' emotions and frequently used the silicone rods to convey emotional flexibility. However, we were pleasantly surprised by the breadth of potential meanings assigned to each piece. For instance, while we'd imagined that the felt volumes could prove useful in illustrating softness and perhaps even passivity, one participant piled a collection of the felt volumes together, creating what she described as 'coziness' and 'warmth'.

Our findings through this exploration illustrate the power of creative tools in supporting expression and provide insight as to the balance between freedom and constraint when designing tools for expression. Given the results of our user testing, we believe that providing participants with an abstract and streamlined palette of materials afforded them a canvas on which they could project deeply complex sentiments. Materiality served as an effective metaphor, lending enough depth to support a nuanced representation without overwhelming the individual with choice. This provided them with a safe space to project and reflect upon their emotions.

Figure 2: *(left)* 'Almatrent', a participant's entry in the Lexicon of Feelings, representing the complexity of feeling calm, grateful, but indifferent; *(right two images)* Scenes from the Empathy Rock Garden at the Mozilla Festival—a rock expresses 'I see you and believe in you', joined by smaller stones placed by other participants, and then also seen in the context of the wider garden, with other things 'weighing on people's minds' including 'Breaking friendships' and 'It's OK to feel not OK'. More photos of the projects and participants' creations are available in a gallery at http://imaginari.es/mmh

Empathy Rock Garden

Empathy Rock Garden (Figure 2) is a space designed for people to share what is 'weighing on their mind' through creating a participatory display. Passers-by were invited to take a rock from a basket, writing a personal message on it, and placing it in the garden. They were also encouraged to take and place small rocks in the garden to signal to others that they are not alone in their emotional state. In the Empathy Rock Garden, communication was anonymous and solitary to create a low barrier for participation. The intention was to produce a short activity that would still reap the benefits of self-expression. We intended for the activity to be individual, but for the results to be collaborative, giving participants a feeling of communal support.

Design process

In our early prototypes, we tested two aspects of the interaction: the 'garden', and the interaction with the rocks. For the garden space, we attempted to section out different parts to represent categories, such as 'family' or 'work', that we thought might be particular points of tension in the lives of students. After piloting, we concluded that this was too prescriptive, and that participants desired a more open-ended interaction. In our exploration of the rocks, we tested how to design them in a way that would support our goals: should the rocks be natural or painted? Stacked or spaced? Facing up or turned over? Through rapid prototyping and testing, we learned that participants wanted to be able to easily read the messages on the rocks, but also for the activity to feel private and calm. Based on pilot feedback, we chose unaltered natural materials, and minimalistic black Sharpies for writing the messages.

Findings

We placed our final exhibit in the campus library, a location that would support the silent and reflective interaction we were aiming for. The Garden was exhibited for two days and resulted in a table full of rocks with very diverse messages. Due to the private nature of participation, we do not know how many participants were involved, or of any of their characteristics. The resulting messages in the Rock Garden were diverse. Some messages expressed concrete things that were weighing people down (for example, a deadline), and some were more abstract messages. The messages also ranged between optimistic and very difficult. People also made use of the physicality of the material. Some participants created proximity relationships between rocks: for example, placed a small rock on top of a big one, or drew an arrow in the direction of another rock. Others used small rocks to create shapes on the surface. One notable example was a cross shape next to a rock that read 'please save me'.

For interaction, we were able to occasionally observe how people interacted from a distance, and noted that placing small rocks that symbolised empathy had a lower participation barrier: more participants placed small rocks, than participants who added new ascribed rocks. Some even gathered a handful of small rocks and distributed them among the displayed rocks.

This project differered from Personalized Potions, in that it highlighted collective wellbeing through materialising it in a shared space. On the one hand, participants had an individual experience in which they were able to silently observe and add their own pieces to the garden. On the other, the rocks they placed became a small part in a larger exhibit representing the wellbeing of their community. We believe that this experience was able to balance the importance of personal expression and the feeling of being part of a supportive community.

Similar to the campus staging, Mozilla Festival participation was anonymous over a two-day period. However, due to the nature of the space, the garden was placed in an area with moderate traffic. We occasionally revisited the exhibit to observe participant interactions from a respectful distance, and noticed that many people felt compelled to read all the messages, and took photographs of messages that moved them. Some participants took rocks away from the table to write messages in private before returning them. One unexpected behavior change we observed was the degree to which participants responded to one another through messages on the rocks and their placement; after a certain threshold of messages expressing personal challenges, a shift to messages of encouragement and self-empowerment began to build a noticeable presence in the garden. We watched as a conversation rooted in consolation and support evolved within the garden over the course of the festival weekend.

Lexicon of Feelings

We come from different places, languages and contexts and each have our own associations with the relatively narrow set of words we use to express ourselves. A common struggle in managing one's own mental health can be the inability to express a feeling or notion to those around you. This project (Figure 2) aimed to explore how we can better communicate complex, personal emotions by creating a new vocabulary through portmanteaus, and ways in which individuals could use new, materialised tools to augment their ability to express themselves.

Design process

Lexicon of Feelings was an activity in which participants constructed collages: assemblages of words (and parts of words), shapes, colours, textures, and forms to create a 'new vocabulary' to express their own individual feelings or the depiction of mental health. Grouped together, the individual 'lexicons' contributed to a shared public installation, creating a collection of new words that are deeply personal and unique, while also enabling participants to see patterns and drawing parallels with other students in the community. This project has some commonalities with *The Dictionary of Obscure Sorrows* by John Koenig (2009), a website 'compendium of invented words for emotion', but Lexicon of Feelings added dimensions of materiality and aesthetics. Furthermore, it was created as an activity for people to carry out themselves, for personal reflection.

Our participants were 30 students, mainly undergraduates at Carnegie Mellon University. They worked through five 'stations' to create their collage, starting with a blank square of foam-core board. The experience itself was meant to be individual and self-guided, through which participants used materials and existing words to construct a new vocabulary which more accurately represented their experience. We provided participants with materials and step-by-step instructions to guide their process of creating a new lexicon:

1. Your Feelings In 3 Words
   How are you feeling at the moment, today or recently? Write down 3 words that describe how you are feeling.
2. Mash-Up
   Scramble your 3 words to invent a new word—your own feeling-language. Write yours on the line of the foam board.
3. What does your word feel like? Look like? Sound like?
   Feel free to pick the materials provided and explore textures, colours, shapes, forms, etc. Show us what your word feels like and attach the materials to your foam board.

1. *Annotate your 'feeling definition' so others can navigate your piece!*
2. *Pin up your vocabulary.*

In practice, many of the participants worked at the same time, alongside each other, and those that did often drew inspiration from each other.

Findings

During the process, we noticed that as participants could see the previous words that others had created, they were able to draw parallels and relate to a similar emotion. Although each final word was unique and had a very different visual aesthetic, there were several root words that appeared more than once, including 'anxious', 'happy', 'excited', and 'hopeful'. Many of the participants commented that the process of assembling the board was therapeutic, similar to the feeling of using colouring books, knitting, or other tasks to calm the mind. Likewise, choosing words to describe a feeling or state of mind allowed participants to identify and pinpoint a particular mental state, or a particular feeling 'in-the-moment', rather than continuous emotions. In some cases, the words embodied seeming contradictions, for example, "*apantig"* (anxious + peaceful + anticipating). Some participants found it easier than others to think of root words or use the physical materials to create a complementary visual. Although the materials and restrictions were the same for everyone, each person created a uniquely personal word and representation which related back to our hypothesis that existing language was insufficient to express certain aspects of mental health, and that there could be value in facilitating a more creative approach to expression.

Reflections and suggestions

The four projects introduced here are only initial explorations: prototypes developed and trialled informally to understand the possibilities of the space, and to start to illuminate directions for further research. The participants in the first stage were predominantly students, befitting the intent to focus on student mental health as a domain, but also introducing specificities of detail and experience of mental health which might not translate to other populations. However, as demonstrated by their additional use at the festival, the methods developed showed potential to be workshopped and explored further in other contexts including public engagement contexts. It is important to note from an ethical perspective, that while a mental health professional from the university's Counselling and Psychological Services advised the students during their project development, the outcomes were not in any way intended to be considered to be therapy tools, nor in any way used to evaluate or make assessments of anything about participants' mental health themselves. We made this clear to participants along with a recognition that participation itself might be painful or difficult.

Even with 'rules' presented for carrying out the activities, participants found ways to express themselves outside of them. In some cases, this allowed for poignant results that might not otherwise have been possible. In others, particularly with unfacilitated interaction such as Empathy Rock Garden, some unexpected interactions did not necessarily contribute to the experience, and at worst compromised other participants' contributions. The tensions between structure and freedom in how the activities were designed were a constant topic of discussion for the design team, particularly apparent in Emotional Modelling with the idea of creating a material- and form-based 'palette' for abstract concepts. Staging the projects in the right environments seemed to matter greatly. The casual, light-hearted nature of the Potion project, and the solitary reflection of the Rock Garden may not have been possible if staged in a different place or time. Having enthusiastic facilitators for the Potions, friendly peers for the Lexicon, and respectful interviewers for the Modelling also helped keep communication flowing.

What is the value of design, and design methods here? In some ways the projects developed could have arisen from art therapy or educational research methods, but we believe that the sensitivities in these projects to materials, to visual and tactile components, and also perhaps to the idea of structure (especially in Emotional Modelling) and prototyping is something which designers' experience brought to the methods in particular. All the projects, even where words were still a major feature, emphasized materiality, and the qualities and associations of materials (Aguirre Ulloa and Paulsen, 2017) and construction in enabling expression.

In terms of benefits to participants themselves, each project allowed for distinct takeaways, physical or intangible. Personalised Potions was an opportunity for very individual reflection, and the artefact that participants received could be a call-to-action to take charge of their mental health beyond their participation in the intervention: even a kind of strategy for the moment. In

Emotional Modelling, participants received a photo of the model they created, but the models themselves were dismantled so the components could be re-used. In Lexicon of Feelings, the finished boards were displayed together, anonymously though perhaps identifiably to other participants who had taken part at the same time. The artefacts of the Empathy Rock Garden were meant to be left behind, to act as a way for subsequent participants to reflect collectively over time.

More generally, the invitation to *share* (or not), or even the 'permission' to reflect on issues or thoughts in one's own life, knowing that others are doing so too—and that there is explicitly no right or wrong way to do it, no scales or quantification or even 'norms' defined—could be seen as other benefits to participants of these kinds of methods. Certainly in the student context, it seemed as though the fact that these activities were created and run *by other students*, could be an important factor. How this kind of constructive peer-creation can be part of mental health education more widely would be useful to explore.

In the light of other 'design sociology' methods (Lupton, 2018), we feel these kinds of approaches can be a bridge between what might seem initially to be tools for 'essentialist' psychological analysis of individuals' mental states (which they are not) and a form of constructive social research. Adapted and used in the right way, these methods could be used for qualitative enquiry into notions and expressions of wellbeing, and how groups construct meaning together. Equally the notion of research through design, enabling the designed artefacts or outputs to be a central part of the inquiry, a way of asking questions in another domain, here demonstrates the potential for these kinds of methods to contribute to applications with wider social benefit and societal relevance.

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Further Reading

Durrant, A. C., Vines, J., Wallace, J., & Yee, J. S. (2017). Research through design: Twenty-first century makers and materialities. *Design Issues* 33(3), (pp. 3–10).

Lockton, D., Brawley, L., Aguirre Ulloa, M., Prindible, M., Forlano, L., Rygh, K., Fass, J., Herzog, K., Nissen, B. (2019b, October). Tangible Thinking: Materialising how we imagine and understand interdisciplinary systems, experiences, and relationships. In *Proceedings of RSD8: Relating Systems Thinking and Design Symposium*. Retrieved from: http://imaginari.es/tangible

Lupi, G., & King, K. (2018). Bruises — The data we don't see. Retrieved from:

https://medium.com/@giorgialupi/bruises-the-data-we-dont-see-1fdec00d0036
Rothstein, J. (ed.) (2016). *Psychobook: Games, Tests, Questionnaires, Histories*. Princeton Architectural Press.
Sanders, L., Stappers, P. J. (2013). *Convivial Toolbox: Generative Research for the Front End of Design*. BIS, Amsterdam.

References

Aguirre Ulloa, M., & Paulsen, A. (2017). Co-designing with relationships in mind: Introducing relational material mapping. *FORMakademisk*, *10*(1).
Bowden, F., Lockton, D., Gheerawo, R., & Brass, C. (2015). Drawing energy: Exploring perceptions of the invisible. *London: Royal College of Art*.
Chang, C. (2018). A Monument for the Anxious and Hopeful. Retrieved from: http://candychang.com/work/a-monument-for-the-anxious-and-hopeful/
de Choudhury, M., Gamon, M., Counts, S., & Horvitz, E. (2013). Predicting Depression via Social Media. In *Proceedings of International AAAI Conference on Web and Social Media*.
Fass, J. (2016, November). Self Constructed Representations: Design Research in Participatory Situations. In *Proceedings of Cumulus 2016*.
Frick, L. (2015). Stress Inventory. Retrieved from: http://www.lauriefrick.com/stress-inventory/
Haig, M. (2018). *Notes on a Nervous Planet*. Canongate, London.
Koenig, J. (2009 to date). The Dictionary of Obscure Sorrows. Retrieved from: http://www.dictionaryofobscuresorrows.com
Koslowski, B., Dawes, B., Bottazi, R., & Ingham, K. (2015). State of Mind. Retrieved from: http://www.benjaminkoslowski.com/#/statesofmind/
Lee, C.H., Lockton, D, Stevens, J., Jia Wang, S., & Ahn, SH. (2019). Synaesthetic-Translation Tool: Synaesthesia as an Interactive Material for Ideation. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems* (*CHI EA '19*).
Lockton, D., Singh, D., Sabnis, S., Chou, M., Foley, S., & Pantoja, A. (2019, June). New Metaphors: A Workshop Method for Generating Ideas and Reframing Problems in Design and Beyond. In *Proceedings of C&C 2019: ACM Conference on Creativity & Cognition* (pp. 319–332)
Lupton, D. (2018). Towards design sociology. *Sociology Compass*, *12*(1), e12546.
Ricketts, D., & Lockton, D. (2019). Mental landscapes: externalizing mental models through metaphors. *interactions*, *26*(2), 86-90.
Rosal, M.L. (2018). *Cognitive Behavioral Art Therapy: From Behaviorism to the Third Wave*. Routledge, New York.
Rygh, K. & Clatworthy, S. (2019). The Use of Tangible Tools as a Means to Support Co-design During Service Design Innovation Projects in Healthcare. In: M. A. Pfannstiel, C. Rasche (eds.), *Service Design and Service Thinking in Healthcare and Hospital Management*. Springer Nature, Switzerland.
Simpson, J. (2017). Visualising Mental Illness. openDemocracy, 10 May 2017. Retrieved from: https://www.opendemocracy.net/transformation/jill-simpson/visualising-mental-illness
Thudt, A., Hinrichs, U., Huron, S., & Carpendale, S. (2018, April). Self-reflection and personal physicalization construction. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (pp. 1-13).

Tversky, B. (2015). The Cognitive Design of Tools of Thought. *Review of Philosophy and Psychology.* 6 (pp. 99–116).

Wellcome Trust. (2018). Mental health: transforming research and treatments. Retrieved from: https://wellcome.ac.uk/what-we-do/our-work/mental-health-transforming-research-and-treatments

Yoo, D. (2018, August). Stakeholder Tokens: a constructive method for value sensitive design stakeholder analysis. *Ethics and Information Technology*.