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# DESIGN4HEALTH

## Melbourne 2017

**Proceedings of the
4th International Conference on Design4Health
Melbourne Cricket Ground, Melbourne, Australia**

**4-7th December 2017**

**Editors: Kurt Seemann & Deirdre Barron**

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# Preamble

Welcome to the first Design4Health Conference in Australia, convened by the Centre for Design Innovation, Swinburne University of Technology, on behalf of, and jointly chaired with, the conference founders, Lab4Living, Sheffield-Hallam University, UK.

The Centre for Design Innovation investigates and validates the key factors that underpin the design of products, services, systems, spaces, and symbols to improve the chance of user uptake and impact.

Lab4Living, who established the conference, is an interdisciplinary research initiative that develops products and environments, and proposes creative strategies for dignified, independent and fulfilled living for all.

This international event invited the world of health and design practitioners and researchers to come together between the 4th and 7th of December, 2017 in Melbourne, Victoria, Australia.

## About the conference

Design4Health is an international conference that brings together designers, health professionals and creative practitioners with researchers, clinicians, policy makers and users from across the world to discuss, disseminate and test their approaches and methods in the ever-changing nexus between design and health.

The conference hosted a series of different events that provided an active forum to explore how the disciplines of design and health might intersect to bring forth new ways of thinking and working in what is a dynamic, innovative and increasingly important area of research and practice. The central question has been:

> How can we work together to achieve positive and sustainable impact on the social, economic and cultural factors within our communities and beyond?

The range and insights presented at the D4HMelbourne event has revealed both the enormous value of this movement in research, and the benefits from undertaking serious, applied, and critical efforts that design and health expertise generate when they come together.

We invite you to browse the innovative ideas and critiques scoped in these proceedings

Sincerely

Associate Professor, Kurt Seemann, PhD. | Convenor | Design4Health 2017

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Lab4Living, Sheffield-Hallam University, UK.
Melbourne Cricket Ground, Melbourne.
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# Scholarly Review Policy for the 2017 International Design4Health Conference Proceedings, Melbourne, Australia.

All papers included in these proceedings have been double-blind refereed by peers and revised to take into account the referees' recommendations.

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# Table of Contents

# The role of users in an innovative service design process in healthcare

Alhonsuo, M. and Miettinen, S.

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## Keywords.

Service design, healthcare, service design process, user roles

## Introduction

This paper discusses users' influence on the service design process, the aim of which is to develop innovative healthcare processes, practices, and services. It presents the results of a case study, involving healthcare professionals and customers, to understand the relationship between users and service designers in the design process. In the development process involving users, different roles need to be identified. Alakärppä (2017) states that in the healthcare context, different roles are apparent and effected by behavior models, which guide an individual's activities. Nevertheless, the stakeholders have a common goal, namely, healing. Service design provides tools for human-centered and participatory approaches and is used to either improve existing services or create new ones (Miettinen 2016, Oosterom et al. 2010). Services imply relationships between customers and care providers; in healthcare, professionals are both the users and providers of internal healthcare ecosystems (Polaine, Løvlie, and Reason 2013, 36). Service design in healthcare affects nearly every interaction in the care process, which forms part of the larger healthcare service ecosystem (Jones 2013, 140–141). Due its complexity, it is pertinent to involve different stakeholders in the development process. Based on the case study, the paper describes how users' involvement in service design helps influence the development of innovative healthcare services, increase equality, and increase empathy among the participants.

The case study, which involved four workshops, discusses how the users' roles were constructed between the designers and two different user groups: (1) the change agents from the hospital staff, who aim to improve the service delivery processes in their own wards, and (2) a customer jury comprising nine citizens, whose role is to represent the service users and participate in the service development process at the hospital. A service designer from the university and a service development designer from the hospital led the design process and acted as facilitators in the workshops (Figure 1).
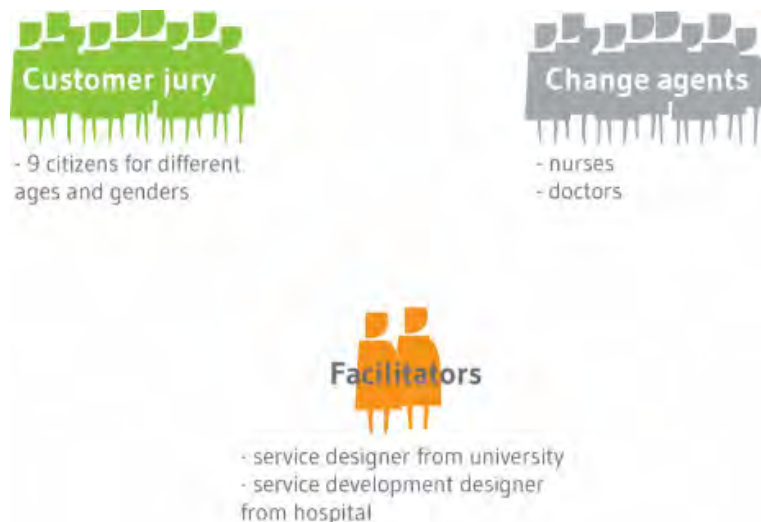
**Figure 1: The stakeholders**

The workshops (Figure 2) were conducted in two different co-creation environments, the SINCO (Service Innovation Corner) laboratory and ITULA. The SINCO laboratory is a service prototyping laboratory at the University of Lapland, which enables a holistic hands-on approach to service design, co-creation, and user-experience-driven innovation activities (Miettinen et al. 2012, Rontti et al. 2012). ITULA is a service development environment for different types of collaborations and meetings at the hospital. The research data in this case study comprises the feedback documented after each workshop and the facilitators' research diaries.
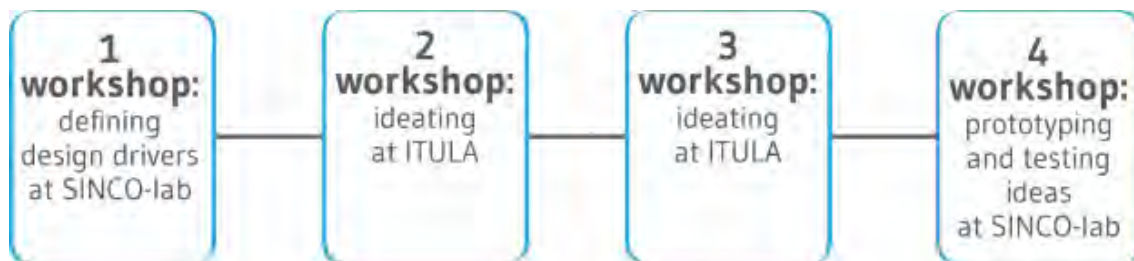


**Figure 2. Four workshops were conducted through the service design process**

# Case study: Service design by change agents and customer jury in a hospital in Lapland

This service development case aimed to develop and innovate the hospital's healthcare services. The process began with a joint service design workshop at the SINCO laboratory involving the customer jury and change agents. Initially, there were no restrictions on the focus of the development process; the participants probed and developed an understanding of different needs, challenges, and ideas of users in the overall care process. The care process began with different concerns relating to the health of individuals or family members, starting from home to the care process in the hospital

and ending with recovery or continuous rehabilitation. This care process was visualized using a map drawn on a large whiteboard. The users discussed their concerns, needs, and ideas and added them to the care process using color-coded sticky notes (green = needs, yellow = ideas, and pink = challenges or pain points). To clarify the care process, the customers and healthcare professionals' notes were organized into different rows (Figure 3).



**Figure 3: From the home to the hospital phases: Above the red process line are the customer jury's sticky notes and, below, are the change agents' notes**

As an outcome of the workshop, the participants could highlight four different themes in which design challenges were identified. The challenges were then iterated and developed further using several brainstorming methods during the second and third workshops at ITULA. The main design challenge was chosen and defined before the last workshop at the SINCO laboratory. The main objective was to develop a new digital care service for patients, which supports the care process from home to the hospital and back home. During the final workshop, this new concept was paper prototyped and role-played in the SINCO laboratory using different customer-service scenarios.

## Conclusion and discussion

The feedback notes and discussions after each workshop revealed that involving a customer jury and change agents in the development process offered the necessary evidence and data to create innovative service solutions. Nevertheless, the innovations came from the facilitators, who played a significant role by suggesting solutions and coming up with ideas that could not be designed merely on the basis of the end-users' experience. This confirms that facilitators exert a strong influence in the choice of design

drivers and lead the development process in specific directions. Additionally, some divergence in roles was observed during the brainstorming methods. The change agents were more aware about money, resources, and bureaucratic issues, which cause barriers to innovation. Therefore, the facilitators need to be ready with suggestions of innovative ideas in order to keep the discussion going and the methods creative.

During the service development process, it is critical to ensure high-quality facilitation and a clear understanding of the service development goals. The users also need to feel a sense of equality and should believe that they are experts in designing new innovative services for themselves. The facilitator's role is mainly a supportive one, to encourage the users to express themselves and to change the methods if the users are not comfortable. In such cases, listening and understanding served to increase the level of empathy between users. During the case study, some divergence in behavior was observed between the SINCO laboratory and ITULA, with respect to how the users behaved in the two environments. These aspects are under observation at the moment.

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# Learning critical communication in social services: Innovations in communication practices and technologies through simulation pedagogy and service design

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## Keywords.

Social work, design-based research, official communication, simulation-based training, service design

## Simulation-based training for social workers

In Finland, health and social services form one tightly intertwined field of public services. Currently, the state is responsible for providing these services, but the ongoing reform of health and social services will transfer this responsibility to counties that are established during the reform. To provide high-quality service in health and social service centers, multi-professional official communication and practices in the new counties should be enhanced and equalized. Part of this work involves disseminating existing good practices to new fields. One such practice is using the TErrestrial Trunked Radio (TETRA phones, Figure 1) and the VIRVE network for routine official communication and emergency-rescue situations.



**Figure 1: TETRA phone, model Th1N.**
**(http://www.airbus.com/newsroom/search.image.html?q=Th1n&lang=en#media-image-image-all-4)**

TETRA phone resembles a traditional GSM phone with common GSM functions. Its appearance and technology are designed to be waterproof, to endure cold weather and to enable using it with gloves. Such physical features are unnecessary in social and healthcare, where the phone's rough design and heavy weight make it difficult to carry indoors. Its use is nevertheless expected, as it enables fast communication by sharing confidential information and supports multi-professional work in disaster situations.

As the role of communication through TETRA phones is being strengthened in health and social services, both operational protocols and practical aspects of staff training need adjustments. This case study focused on developing multi-professional critical communication in public social services through simulation pedagogy and service design. These two approaches have proven effective in developing activities and training in various locations. Our particular tasks were to test an alarm blueprint that was developed for delivering social services in emergency situations and to develop simulation pedagogies that could be integrated into the everyday work of municipality officials (see also Vuojärvi and Keskitalo, 2016).

## Methods

At its core, simulation-based training means imitating reality in learning settings that offer safety and experience (Dieckmann 1999). Service design creates multi-channel solutions for services and processes, focusing on user experiences and stakeholder interactions. Service design uses generative, formative, and predictive methods (Fulton 2008) of concretizing innovations, and e.g. fast prototyping and visual techniques to make processes more understandable.

The developmental work was carried out in a municipality in northern Finland as a design-based research (DBR) project (Design-Based Research Collective 2003). The case study began in the autumn of 2016, and the results of the first DBR cycle are reported here. Through iterative phases of design, enactment, analysis, and redesign, we aimed to answer the following research question: What is the additional value of combining simulation pedagogy and service design methods in developing innovative communication practices and technologies in public services?

During the design phase a general plan for the project's DBR cycles was generated through service design methods. The plan included descriptions of each stakeholder's (researchers, information and communication technology companies, authorities from different fields, and facilitators) duties, the aims, and the timetable. Next, police officers, firefighters, social workers, and paramedics (N = 15) were interviewed and observed their respective tasks in one shift. This helped in establishing an understanding of the current state of their respective processes and contexts. Our field notes and memos described the observed operational protocols and everyday communication processes, as well as development ideas, providing a starting point for innovative thinking processes. Regular meetings with social workers, their superiors, and municipality's security head were arranged to plan the upcoming simulation training. We also determined the acknowledged developmental tasks concerning critical communication by reading the official reports on serious accidents and crisis situations in Finland (e.g., Accident Investigation Board 2005, 2015; Ministry of Justice 2009).

The enactment phase was realized through simulation training. First, through computer-based mobile simulations, social workers learned how to use TETRA phones by using the TETRAsim ONE simulator software on tablet computers. The simulator was tailored to match the participants' work environment. The users were free to train individually or as a team for four weeks before participating in a half-day, scenario-based, in-situ simulation training session in the city hall. During training, the social workers first practiced basic communication protocols by using TETRA phones; afterwards, on-call social workers were trained the proper response to the alarm system in case of a fire in an apartment building.

During the design and the enactment phases, empirical data were collected through various means, including meeting memos, observation notes, user diaries, video recordings, and log data from TETRAsim ONE. The data were qualitatively and quantitatively analyzed.

## Results

Service design methods in the design phase of simulation-based training generate an in-depth understanding of the participants' aims and enhance the context-sensitivity of training. Service design practices engaged the participants in designing their training and visualizing their goals. This strategy supports transferring the knowledge gained through training later to everyday work and understanding different officials' roles when dealing with emergencies. Utilizing multiple types of simulation-based training (computer-based, in-situ, scenario-based) helped our participants concretely realize the deficiencies and development needs, in this case, in their alarm blueprint and their communication skills and protocols during the crisis.

## Conclusions

Through a novel combination of service design and simulation-based training in a DBR case study we generated innovations for context-sensitive official communication practices and technologies. The alarm blueprint was adjusted for the smoother flow of operational communication. TETRAsim ONE is under a gamification process (see also Keskitalo and Vuojärvi 2016) to make computer-based simulation training more engaging and fluent. A TETRA phone application will be developed to enable using TETRA technologies on a smartphone.

Regarding the limitations of our study, we acknowledge that many variables may affect the success of designed experiments, and effective pedagogical practices will develop only through subsequent refining and testing. Thus, the practices developed here must be implemented often enough to reach sufficient coherence. Real-world situations and contexts are complex, and reaching entire participants' experience is difficult, even with large amounts of varying data.

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# Foyle Bubbles: How can design reduce suicide attempts using everyday social and civic spaces?

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## Keywords.

Suicide, Behaviour, City, Person-Centred

**Introduction**

This paper is submitted in tandem with the related paper 'Foyle Reeds: How can design reduce suicide attempts at a specific place whilst at the same time improving the experience for all?'

The River Foyle and its environments, banks and bridges in Derry/Londonderry in Northern Ireland have become associated with poor mental health and emotional wellbeing. 'Our Future Foyle' is a collaborative research initiative looking at how health and wellbeing can be designed into the riverfront in the city as a means of suicide prevention.

This paper discusses one aspect and output of the research and design process: 'Foyle Bubbles'.

## Process and Engagement

### 1. Methods

In order to carry out research and engage with the community as a whole the team have been carrying out a series of architectural interventions during city scale events. Using various co-design methods, the project has sought people from across the community, in an area which is known for its past conflict. Given the importance of providing opportunities for the whole community to have their say, the team created an engaging research space both on land and water, based on a local legend: a killer whale named Dopey Dick who swam up the river in the 1970s (a figure warmly remembered by both communities). The team also hosted a Cinema Premiere of a local film based on the River Foyle. Using the research space, and accompanying events, the team connected with over 5,000 people conducting more in-depth research with over 100 individuals, and have a digital reach of over 10,000 people. These methods fit into the Double Diamond design process (Design Council, 2005).

### 2. Results

City scale events focused on the riverfront increase footfall, temporarily transforming a negative and dormant public space into a destination with activity and positivity. Interviews with public health figures and the local search and rescue team showed that

during these events, suicidal behaviour and attempts on the riverfront and bridges do not occur, pointing to a sense of community cohesion as a factor.

The team's engagement with the community showed an evident need for public services and destinations along the riverfront. Individuals said they felt that 'there is nothing to do or nowhere to go at the river' and 'there are not enough shops and cafes along the riverfront'. Further interviews corroborated these insights, showing the need for cafes and shops, weather shelters, public toilets, mental health therapy spaces, youth zones and activities.

More broadly, the research showed the need for shared space along the riverfront. People within the community felt that 'one side of the river gets more than the other side'. This pointed to the need for movable spaces that could respond to the needs of different areas of the waterfront without having to be located in one area. Such spaces would allow flexibility, and could be occupied by a variety of organisations and individuals to create a network and reinforce that community congestion.

### 3. Discussion

'Foyle Bubbles' are a series of satellite spaces designed to house arts, commercial, educational and well-being activities around the riverfront; these will act as suicide deterrents and increase footfall and so achieve natural surveillance of the site. These portable pods offer the opportunity for enterprise and community engagement through social and civic functions. The individuals or organisations within the pods will undertake mandatory mental health training in return for reduced rent, thus enabling everyday engagement within the community whilst at the same time providing mental health support and counselling without stigma or a clinical setting. Figure 1 shows the potential uses of the 'Bubbles', along with engaged stakeholders and activities.
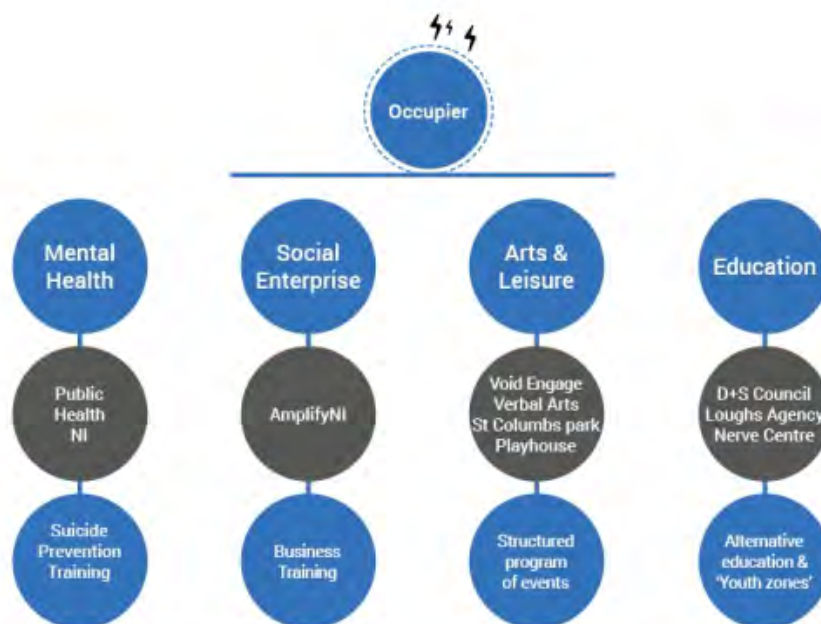


**Figure 1. Uses of 'Bubbles', stakeholders and activities**

In addition to the specific activities within the pods, an important function of the 'Bubbles' is to increase the presence of people in the immediate area, and thus improve the sense of life, positivity and community cohesion of the space by bringing people together. The local district council is looking at an alternative education programme in which the hardest to reach youths within the community have the opportunity to learn and develop business skills among the enterprises that occupy the pods. The portability of the pods is key to their success as they are able to respond to identified negative areas on the riverfront, and thus accommodate the changing needs of the local environment and community. Working in tandem with the local city CCTV initiative, the pods can be placed in areas with poor footfall or illuminate to become cultural beacons when not in use at night (figure 2). During these hours, the illuminated pods can light up areas associated with anti-social behaviour (or areas with low lighting), aid statutory services and provide spaces for people at point of crisis.
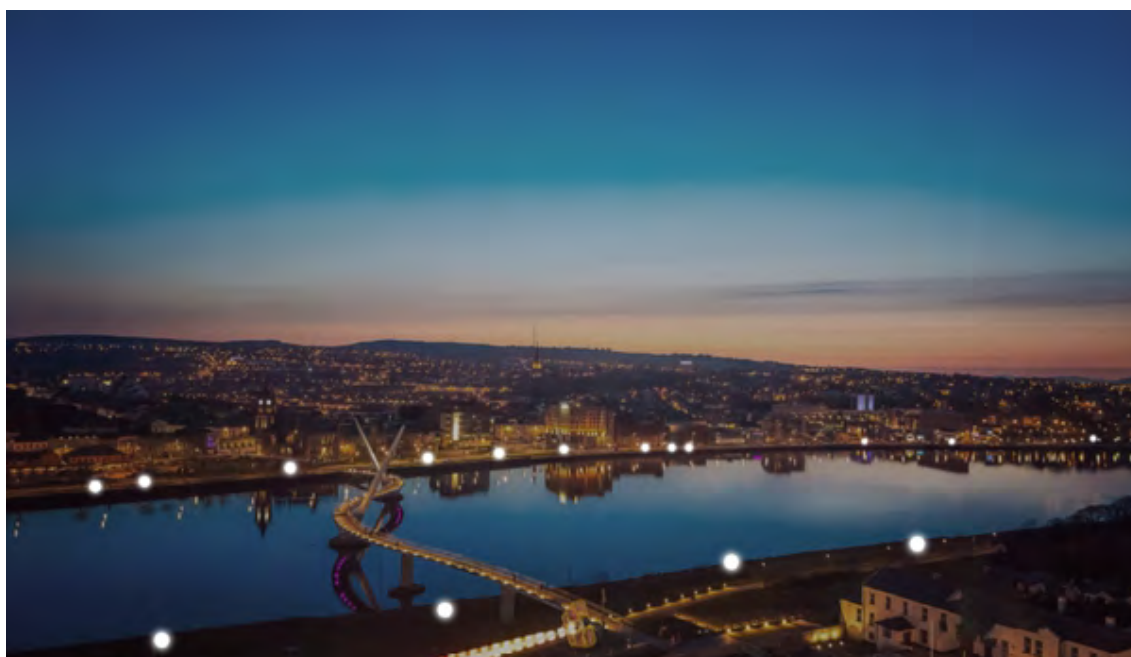


**Figure 2. 'Bubbles' as beacons in night mode**

## Conclusion

The 'Foyle Bubbles' concept emerged from a broad research and co-design project with multiple outcomes. With good stakeholder and community buy in, the team are now establishing the initial occupiers of the Bubbles. A pilot phase of a few pods at agreed locations, with co-designed features and functions, is currently being explored. The implementation of this small-scale trial will inform the statutory structures, environmental and community factors that can optimise their effectiveness. This pilot and subsequent measurable data provide the necessary evidence for larger procurement and roll out across the local community and service users with the hope of creating a connected, engaged and positive community on the river with the needs of people in crisis at its heart.

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# How do space and information technology affect patients' waiting experience in an ambulatory centre?

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*University of Leuven - KU Leuven, Belgium*

## Keywords.

Ambulatory centre, Information technology, Patients' experience, Space, Waiting experience

## Introduction

A frequent complaint about hospital visits is the waiting time. When planning to build a new ambulatory centre, the university hospital under study decided to approach waiting alternatively. Instead of extended waiting areas for each department, they opted for one general waiting zone. Additionally, the hospital wanted to use information technology to guide patients while waiting, allowing to visit the cafeteria or explore the (future) shopping boulevard in the complex. How patients would experience this configuration and which role space would play therein was unclear. Our study therefore aimed to gain insight into the relation between space and information technology and their joint impact on waiting experience.

## Research Approach

Based on an initial consultation with hospital management and staff regarding their concerns about the waiting organization in the new centre, we organized three interactive sessions with eight (former) patients each. Two patients were accompanied by a relative. For each session, we recruited a diverse group in terms of gender, age, and physical condition. Participants were invited to come to an actual hospital location covering different sizes of waiting areas, treatment rooms, a coffee corner with low tables and armchairs, and corridors decorated with artworks.

Upon arrival, a researcher welcomed participants and gave personal instructions about how to proceed. Based on realistic waiting scenarios provided by the hospital, individual waiting trajectories differing in terms of duration and location were mapped out. Each participant followed one waiting trajectory informed by a mock-up of an information device. Some received a pager, providing information on the duration of and reason behind the waiting and instructions on what to do next. Others were given a smartphone, with the pager's information plus additional options to pass time, e.g., consulting their medical record, following an art route, or being informed about the hospital. The remaining participants were handed a leaflet with an identification number and asked to follow the instructions on a public display. Two researchers observed participants throughout the waiting time.

After the waiting session participants met for a follow-up focus group interview. The interview started from their waiting experience and how it was affected by using a certain information device. These insights served as a basis to reflect on previous waiting experiences in other hospital settings. Throughout the interview specific attention went to spatial qualities in relation to ways of information provision. We gauged how different spaces were experienced and used, which elements influenced the decision (not) to use a certain space, and how the provided information affected this decision. These interviews aimed to gain insight into why participants took certain decisions and how they experienced waiting during the workshop compared to real-life situations.

Observations of the waiting trajectories and focus group interviews were analysed and positioned against insights from previous research in hospital settings. Maister's (1985) eight statements about the experience of waiting served as a backbone to structure the insights gained through the study and communicate them to the hospital management and staff.

# Findings

Regarding the role of space, participants' experience seemed affected by spatial qualities, the available equipment and what a setting affords. Relevant spatial qualities include the size of the space, mostly mentioned in relation to air quality, temperature, and acoustics. Also, the presence of pleasant (natural) light and a view towards outside were appreciated. Access to outside would have been even better. The available equipment affects how people in waiting areas (have to) interact. Rows of attached chairs make others' movements noticeable, whereas separate seats allow choosing how and with whom one interacts. Passing time in a meaningful way requires the waiting space to be equipped to do so. A table to put your laptop or a comfortable chair to read a book could suffice. Finally, how a space is experienced is affected by what it allows users to do. A space can stimulate intimacy or support interaction and activity, thus balancing personal and social space. Using information technology can help herein by informing patients about other patients' needs or wishes.

Participants liked to be informed about waiting time, medical issues, and the hospital in general. Being informed gave them a sense of control, more freedom to move around and the opportunity to choose how to pass time. Knowing why one waits also helps in the perception of waiting. Being informed about delays in advance so they could adapt their behaviour accordingly was appreciated even more. Which way of information provision was preferred differed amongst participants. Flexibility and choice seem to be the key to offer individual participants an optimal experience. However, they preferred being assisted and informed by an actual person over a device. When participants discussed their perception and expectations of space and technology, the importance of social interaction stood out. Depending on their state of mind, occupation and attention were important issues that could be affected by space and technology. Beforehand, patients' experience is shaped by what they expect from the hospital and by the information provided. During the visit, what is happening and why affects experience.

**Conclusion**

The impact of space and information technology on how patients experience waiting in an ambulatory centre cannot be considered separately from the social interactions they trigger. When a hospital reflects on waiting experience, which is influenced by the design of the waiting area and information provision, each decision needs to be weighed against the social dynamics it generates. Furthermore, ongoing social dynamics affect perception of space and technology. Additionally, waiting extends beyond the hospital premises. The next waiting process starts when a new appointment is made. By consequence information should be provided both within and outside the hospital over an extended period. The offered technology should be able to deal with this variety of locations. Finally, we suggest some strategies to implement the insights gained in organizing future waiting process: provide diversity in spaces and technologies to offer patients options in (social) interactions; communicate before, during, and after each hospital visit; and guard that patients can identify with the provided space, the offered device, and the choice for both.

## Acknowledgements

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# When interest pays off: The relationship between motivation, wellbeing and learning of technologies by older adults

Beh, Jeanie and Sonja Pedell

*Swinburne University of Technology, Melbourne, Australia*

## Keywords.

Ageing, Older Adults, Interest, Wellbeing, Mobile Touch Screen Technologies.

## Introduction

Many argue that older adults seem to lack interest and motivation in the use of technology, leading to numerous misconceptions about their capabilities and aspirations, towards devices. Yet in reality, many older adults in their third age enjoy the challenge of learning new skills and of pursuing new interests and hobbies. This paper challenges and contradicts these misconceptions through researching the conditions and strategies required to encourage the adoption of mobile touch screen technologies in older demographics based on motivating their interest, developing their capabilities and consequently promote and assist them along the pathway to ageing well. Studies have been shown that ongoing engagement with technology leads to better health outcomes, for instances, decreased depression, opportunities for social support (Bemis, 2013) and connection to government services and health resources (Smith, 2014). This research is based on the Four-Phase Model of Interest Development (Figure 1) by Hidi and Renninger (2006). The model was adopted to provide a construct on which to base specific trials with older adults. The results highlight the capacity of this group to adopt and utilise modern technologies in meaningful ways promoting wellbeing. A survey undertaken after the trials highlight the benefits of this approach and firmly dismisses the myth that older adults cannot adapt to new technologies.
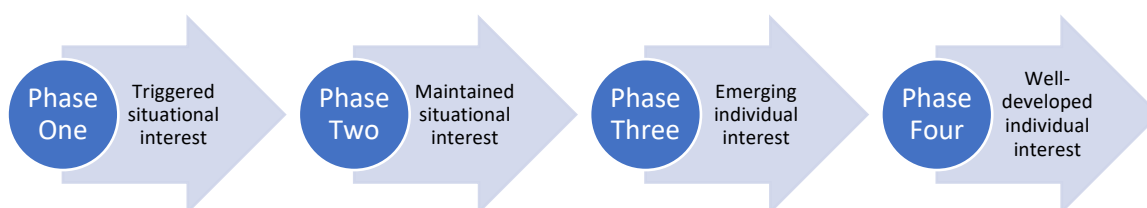


**Figure 1. The Four-Phase Model of Interest Development by Hidi and Renninger (2006) interpreted and illustrated by Beh et al. (2015).**

**The Four-Phase Model of Interest Development**

The Four-Phase Model of Interest Development consists of the following: (1) phase one: triggered situational interest, (2) maintained situational interest, (3) emerging individual interest and (4) well-developed individual interest. Triggered Situational Interest in phase one generally results in short-term changes. It is usually caused by the

environment and peers. Phase two Maintained Situational Interest is considered to be the subsequent state and may also be sustained through peers and environment. Phase three is Emerging Individual Interest. It occurs over time, might not necessarily be self-generated as it may be supported by external factors. Phase four, Well-Developed Individual Interest takes place over a period of time. It is usually effortless and sustained over a longer period.

## Methods

We also found out that the topic of *interest in learning* appeared more than a hundred years ago (Herbart, 1891). After this initial appearance, it was encountered infrequently until the 1980s when it entered into the field of educational psychology (Silvia, 2006). At present, research in interest is mainly associated with early learning and adolescence within a school environment of academic subjects. This interest development model is applied to children and young adults but focus neither on older adults nor on technology learning. Neglected as a strategy in adult learning we propose it might be an opportunity as a strategy for higher uptake of technology by older adults in order to increase quality of life and wellbeing. Henceforth, we are interested in investigating whether it also applies to older adults as this concept has not been used for them.

However, unlike children in a classroom setting, older adults can differ greatly in background, level of technical experience and knowledge and may have issues with availability for classes. Our investigation was best served with a Living Lab approach using mixed methods with a strong focus on the experiences of the user because to date, there has been very little research about how technology could support older adults' interests. In light of this, over 131 older adults and 13 teachers and staff members participated in our study. Observations and interviews (one-to-one and focus group) provided deeper insights into teachers' experiences and practice. These qualitative methods provided an effective means of data gathering due to the fact that older adults were not always able to articulate their attitudes and problems with technology. Thematic analysis provided a means of examining the data.
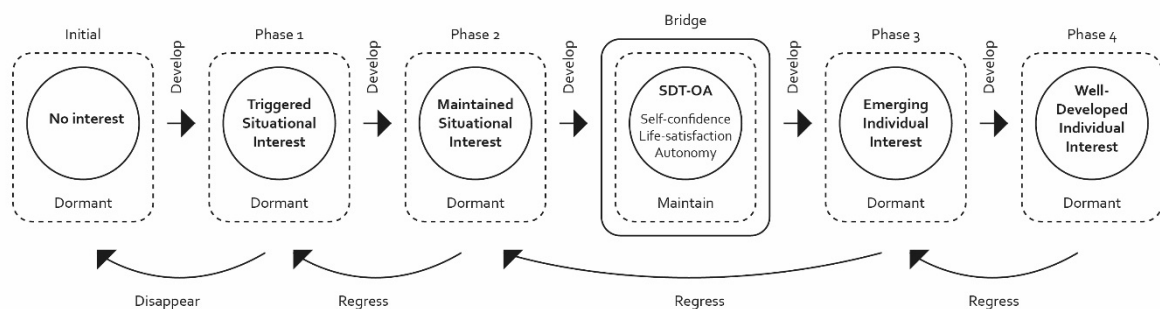


Figure 2. Interest-Bridge Model by anonymous, (2015; 2016).

## Results

Findings suggested that engagement through individual interests and hobbies and social settings could assist in motivating the learning of technology for older adults. Yet, it also raised the question of the level of intervention required to motivate participants to develop their interests from one phase to the next. An investigation of motivation literature led us to a collection of different motivational models and consequently, we incorporated into our conceptual framework a second existing model – *Self-Determination Theory* (SDT) developed by Deci and Ryan (1985). It became the *Bridge* that involved intrinsic motivation, comprising of *autonomy*, *competence* and *relatedness*. Throughout the study phases, based on our findings, we continued to refine the interest model. However, we came to realise that two out of the three existing elements of the SDT model did not seem to fit towards the roles of learning in mobile touch screen technologies for older adults. It led us to further explore literature relevant to motivation and uncovered Carstensen's *Socioemotional Selectivity Theory* (SST) (1996), also known as the *Lifespan Theory of Motivation*. We updated the elements in the *Bridge*, *autonomy* remained, while *self-confidence* replaced competence and relatedness was substituted by *life-satisfaction*. Interest or the desire to know about something or relevance to a need or a passion is a main driver in technology adoption for older adults and our *Interest-Bridge Model* (Figure 2) (Beh et al, 2016; 2015) is helping to address this gap.

**Conclusion**

Results of the final study suggest that our interest-based workshops help to support older adults' interest in technology as we paired participants' individual interests and hobbies with equivalent apps. Feedback from participants were positive and they were very engaged throughout the study. In our discussion, we looked at building on interests and experiences, learning of basic tablet interactions, applying learning in real-world contexts, repetitions of things in favour to singular tasks and peer-supported environment for socialising and sharing of problems and successes. In addition, we have produced a set of guidelines that can be used for running of Information Technology (IT) related activity learning groups for older adults. In conclusion, it is imperative to ask and find out from older adults what they would like to learn. Subsequently, design activities to associate with their individual interests and hobbies that could be incorporated into their everyday lives.

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# Fit for purpose

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Ageing; food packaging; hospital; assessment; design.

## Introduction

Packaged food and beverages are commonly used hospital environments for single serve portion control, convenience and cost savings (Rechbauer 2013). Older adults occupy almost half of Australian hospital beds and this percentage will increase with the corresponding ageing of the general population (Australian Institute of Health and Welfare 2017).  The provision of packaged hospital food service to these older adults is relevant as researchers have estimated that 40% of UK hospital patients were malnourished with 60% at risk, with the. . .' average food intake less than 75% of that recommended, particularly among the elderly' (Schenker 2003). In fact, studies have shown that older patients are five times more likely to be at risk of malnutrition than younger patients (Lazarus 2005, Banks 2007, Vivanti 2008).

A malnutrition prevalence study highlighted the difficulty experienced by patients in opening food and beverage packaging with a number of these patients indicating that they did not eat the food because they could not open it (Mathews 2007). Further work has also identified inability to access food and beverage packaging as a contributing factor to malnutrition among the elderly and disabled in hospitals (Walton 2006, Tsang 2008). The relationship between grip strength and the difficulty to open packaging has also been investigated (Bell 2013). This study measured 140 participants (mostly elderly inpatients) and 64 staff members recruited from local public hospitals. Several food and beverage packages were found difficult to open by at least 40% of patients. These included milk and juices (52%), cereal (49%), condiments (46%), tetra packs (40%) and water bottles (40%). The authors have subsequently undertaken further work to assess the effect of dexterity, grip strength and packaging (Bell 2017) and analysing the effect of posture on packaging accessibility (Bell 2016).

The issue of poorly performing packaging was also highlighted by the NHS in the UK. In 2013, the NHS set up a taskforce to look at the problem of poorly designed single portion packaging and possibility of implementing a strategy of removing it from the supply chain.  As part of this work an initial study was undertaken to assess the packaging using the user test protocol described in Annex D of ISO17480 (International Organisation for Standardisation (ISO)). This protocol was developed in response to the issues highlighted

about older people's inability to access packaging. The results of this work were first presented by Yoxall and Lecko at the Hospital Caterers Association conference in Liverpool, UK in 2016 and subsequent work by the authors is currently under review.

Work by these authors has also indicated that much of the dissatisfaction with packaging and the poor ratings that packaging receives when being assessed in protocols such as Annex D of ISO17480 is very dependant on the time taken to open the pack. Whilst much of the previous research has concentrated on user capabilities and issues surrounding loss of capabilities as people age, very little work has looked at the attributes of the packaging and the attributes of the packaging that contribute to the time taken to open the pack from an ergonomics perspective.

Hence, the work presented here is an initial study exploring the issues surrounding the relationship between time taken to open a pack and satisfaction and a basic ergonomics task analysis method. The subsequent aim is in understanding the issues around the packaging 'failure' in order to assist packaging designers, brand owners and manufacturers to 'design out' some of the ergonomic issues relating to the poor performance of packaging.

## Methods

The method used to assess the packs was similar to that proposed by the User Panel Test method CEN15945 (2011) and Annex (D) of ISO 17480 (2015). Participants are asked to familiarize themselves with each packaging item and then subsequently attempt to open the packaging. For the purposes of this research participants were asked to only give a rating of their overall satisfaction on the opening experience. Packaging is rated on a Likert scale (the scale is defined in the standard). For the purposes of a pass or fail of the pack the ratings of "Extremely Dissatisfied", "Dissatisfied" etc., are converted to a score (1 for "Extremely Dissatisfied", and 5 for "Extremely Satisfied"). A pack is recorded as a failure if within the 20 people cohort there is an example of pack being unable to be opened within the time limit (defined as 1 minute) or the overall satisfaction score ranks below 3 ("Satisfied"). The test can be repeated on another cohort if there is a likelihood that the number of failures will remain below a specified number or the likelihood of a score of 3 ("Satisfied") can be attained. The test stops completely when the number of participants reaches 100. In addition, a basic task analysis process determined the number of actions required by the user to access the pack contents. The packs tested are in Table 1.

Table 1. Items selected for initial testing

| Item | Pack Description |
|---|---|
| Jam | Single portion polymer lid/forming |
| Fruit Pot | Polymer lid/ polymer pot |
| Orange Juice | Aluminium/Polymer lidded polymer pot |
| Jelly | Aluminium/Polymer lidded polymer pot |
| Cheese | Single portion shrink-wrap polymer |
| Crackers | Double portion flow wrap |
| Milk | Single portion polymer lid/ jigger |
| Biscuits | Double/Treble portion flow wrap |
| Spread | Single portion polymer lid/forming |
| Sandwiches | Standard triangular carton skillet |

**Table 2 shows the mean opening time (sec), the number of pack failures (unopenable packs, mean score), the overall pass/fail and the number of actions required to open each pack. The results indicated that seven of the ten packs tested failed the ISO standard panel test. Five packs, the jam, fruit pot, cheese, and the biscuits failed due to participants being unable to open the contents in the allotted time; with crackers, milk and sandwiches failing due to being rated below 3 'Satisfactory.'**

This initial study showed a high correlation between time taken to open the pack and low satisfaction, including giving up opening the pack. The time taken to open a pack is complex, linked to the users expectation of the time to open a pack compared to the actual time, the user's ability (dexterity, strength and cognition) and pack properties. This study is an initial attempt to look at the relationship between the attempts to open a pack versus satisfaction. The results indicate that packs with a high degree of subtasks (such has sandwiches) and packs that require high levels of manipulation are more likely to fail than packs with minimal subtasks/manipulation.

| Item (n)=20 | Mean Time To Open S (SD) | Number of failures | Mean Score | Pass/fail |
|---|---|---|---|---|
| Jam | 10.89 (9.01) | 3 | 3.0 | Fail |
| Fruit Pot | 10.50 (6.46) | 3 | 2.86 | Fail |
| Orange Juice | 5.14 (2.79) | 0 | 4.79 | Pass |
| Jelly | 4.37 (2.00) | 0 | 4.64 | Pass |
| Cheese | 15.51 (7.91) | 6 | 1.92 | Fail |
| Crackers | 16.6 (9.40) | 4 | 2.85 | Fail |
| Milk | 8.42 (4.34) | 0 | 2.43 | Fail |
| Biscuits | 9.62 (3.48) | 2 | 3.43 | Fail |
| Spread | 3.45 (2.00) | 0 | 4.64 | Pass |
| Sandwiches | 16.73 (7.84) | 0 | 2.86 | Fail |

**Table 2. Pack time to open, satisfaction score and rating**

Previous research by Bell has found similar results for the same packs with effective pack opening associated strongly with higher levels of dexterity (Bell 2016, 2017). The design of the pack demanding high levels of dexterity from the user, either because of the number of actions required to open the pack, or due to the small and 'fiddly' access points on the pack.

## Conclusion

As the population ages, older patients with multiple health issues will become the default patient. In the community, single older person household numbers will increase, expanding on a willing market for packaged products for convenience and to limit food waste (Joutsela 2015). Designers and manufactures can successfully cater for this growing market by adopting principles of universal design: 'The design of mainstream products…that are accessible to, and usable by, as many people as reasonably possible ….without the need for special adaptation or specialised design' (British Standards Institute (British Standards Institute 2005)). Utilising the User Panel test method and undertaking simple ergonomics analyses such as task analysis are techniques that can assist the iterative design process for food and beverage packs to improve openability and capture this emerging growth market.

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# Design standards and disability: Limitations in person-centred home modifications

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## Keywords.

Design, fall prevention, home modifications, health and standard

## Background

Person-centredness is a healthcare ideology which focusses on the goals and the abilities of the client rather than concentrating on their incapability (National Ageing Research Institute, 2006; Sanderson, Kennedy, Ritchie, & Goodwin, 1997). Fall prevention service providers aim to deliver person-centred home modifications. However, the use of AS 1428.1 within the context of person-centred older adult fall is problematic.

Firstly, AS 1428.1 references design requirements for new building work in Australia. The standard specifies the technical elements needed to design building spaces that "achieve the level of access required for a deemed-to-satisfy solution" (Standards Australia, 2009, p. 5). Occupational therapists and architects to refer to AS 1428.1 when designing and recommending fall preventative home modifications. Adhering to AS 1428.1 is not a formal service requirement; yet, no other related design standard is applicable. Secondly, the AS 1428.1 was originally published in 1968 and was amended in 2009. However, gaps exist concerning the applicability of the design recommendations for an older population as AS 1428.1 "is based on data resulting from empirical testing of persons aged between 18 and 60 years and may not be appropriate when applied to persons outside this age range" (Standards Australia, 2009, p. 5). Thus, older adults over 60 years of age fail to be represented within the standard that guides home modification design. The utility of a design standard that fails to address older adults is contradictory to person-centeredness. Therefore, this research aims to give the practitioners a strong voice to substantiate why a new standard is needed.

## Method

Semi-structured interviews with eleven professionals from five fall prevention service providers were conducted. All participants had a combined 170+ years working experience within the health sector. The participants specialised in various fields including occupational therapy, physiotherapy, specialist disability architecture and aged care business development and management or team leadership.

## Results and discussion

*Standards and person-centred practice*

All participants stated that they followed the AS 1428.1; however, in practice occupational therapists and architects work around the standard's recommendations to create retrofitted outcomes that are more applicable to the individual needs of their older clientele. An identified theme amongst all clinicians was that the design guidelines are not in the spirit of person-centredness.

There are practical issues related the age of the supporting data. The following quotation emphasis this:

Participant K (disability specialist architect):

*"It is based on old data which was done back in the 70s and 80s, so much has changed…"*

Furthermore, since the collection of the data supporting the 1428.1, significant advancements have been made in other related fields including assistive technologies. For example, wheelchairs and walkers are commonly used in conjunction with ramps; the standard does not account for this:

Participant K (disability specialist architect):

*"… It is also based on someone who is self-propelling in a wheelchair. What about someone who is assisted? What about motorised chairs, scooters, motorised beds, these other modes of getting around that aren't covered."*

Furthermore, the age range of the data (18-60) that supports the standard commonly raises problems as well; Participant K (disability specialist architect):

*"Most of my clients are way over that."*

The other side of the issue is the intended new building purpose of the standard itself. Within the context of environmental retrofitting fails to provide an accurate design basis:

Participant K (disability specialist architect):

*"It is the only standard that we can refer to, what we need is to have another standard for retrofitting existing houses."*

Age and retrofitting create common service problems which clinicians and older adults confront on a daily basis.

## Barriers and problems

As a consequence of the standard on new building works more problems arise; these are highlighted below:
Participant E (occupational therapist - domiciliary care):
*"I don't even think I have been to a household that allow enough room to apply the Australian Standards to it … You must work with the space you have got … you're always having to adapt what you're meant to do."*

Advised circulation spaces are problematic, in particular the landing size, a minimum is specified; however, it is too small:

Participant K (disability specialist architect):

"I have had people tie string into the key to pull it out, or put a tie around their neck to shut the door behind them. That hasn't been addressed and is major a problem."

Alternative approaches have been taken by clinicians to both communicate and cover liability issues linked to deviation from the standard. Participant E (occupational therapist/domiciliary care) highlights this below:

"There are a few forms about deviating from the Standard, it is not a formal form. It is something that I created several years ago because this came up all the time … because we're deviating from what the standards are doing but we have a reason for it."

The barriers and problems highlighted directly affect the person-centredness of the fall prevention service. These issues stem from the application of a poorly fitting design standard, one which fails to address older adults.

**Conclusion**

Fall prevention service providers aim to deliver personalised home modifications for older adults. However, disability design standards that are used in practice fail to accommodate for the nature of retrofitting, the older demographic or the improvements in disability aids that are commonly used in conjunction with modifications. The research presented highlights the need for a new design standard, one which address the issues raised and promotes greater person-centred home modification design processes and outcomes.

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# The prototyping process of a patient support device for radiotherapy of breast and regional lymph nodes in prone position

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## Keywords

Iterative prototyping, composites, breast cancer, user centred design, prone crawl radiotherapy

## Introduction

The current two major concerns in medical device development (MDD) are improvement of patient safety and medical performance (Balka et al. 2006). Although many authors have stated that the application of a user centred design (UCD) approach in MDD can have several benefits (Grocott, Weir, and Ram 2007), the users are generally not brought into the development process until after the design brief for a new product has been produced (Jennifer L Martin et al. 2010). This may be because medical devices are frequently technology driven and often bound to time and financial constraints (Jennifer L Martin et al. 2012).

By involving stakeholders early in the design process during every iterative prototyping phase (figure 1), we want to demonstrate its advantages in comparison with the current approach.
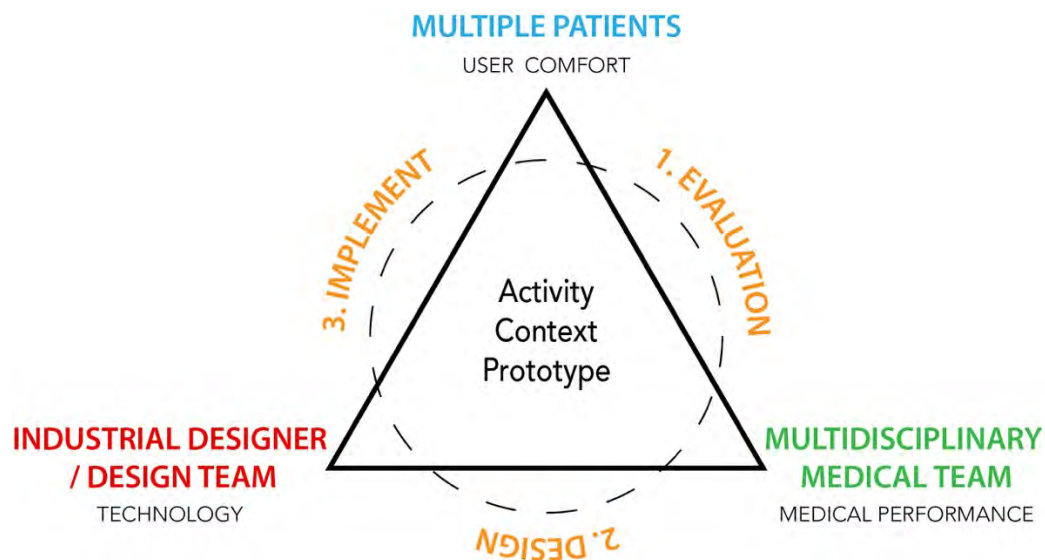
**Figure 1. Triangle between most important stakeholders during medical device development. Through each iteration, the proper design approach which best suites the activity, context and prototype is selected and the stakeholders' values (user comfort, medical performance, technology) are evaluated (adapted from De Couvreur and Goossens 2011).**

The first three prototyping phases of the development of a prone patient support device (breast board) for radiotherapy of breast and regional lymph nodes are described (Boute et al. 2017; Deseyne et al. 2017).

## Methods

## Phase I

Basic parameters of the device were determined to obtain the new crawl position. Low fidelity prototypes were produced with inferior materials and basic skills. Volunteer user tests were executed on a small scale(n=9). CT-scanned cadavers were used for beam access optimization.

## Phase II

More advanced prototypes were produced with integration of previous adjustments. Derived from phase I, a mould was produced for resin infusion moulding (RIM) of a fiberglass structure. Prototypes were modular constructed and each part could be adjusted and indexed. Instead of developing a new prototype for each iteration, specific parts were redesigned and improved. In this phase, the use of more durable, qualitative materials and advanced prototyping techniques were applied since they needed to be functional, accurate and tested in real environment. A comparative study (n=10 patients) was performed comparing the prototype with the standard supine breast board at our centre.

## Phase III

Based on phase II prototype, a CAD-model was derived and optimized. A mould was CNC-milled for production of high fidelity, RIM fiberglass prototypes with durable and

structural materials. Small iterations were performed and sub-parts were improved. A small series of 4 (2left, 2right) devices was produced and used for a clinical trial (n=40 patients).

# Results

## Phase I

First prototype iterations were made from recovered medical parts, wood and polyurethane foam blocks (figure 2). These blocks were sculpted by using basic skills and tools. A new patient position was explored, better breast support was achieved and different arm positions were tested. The prototype was laminated with fiberglass and polyester resin for added strength and used for volunteer testing.
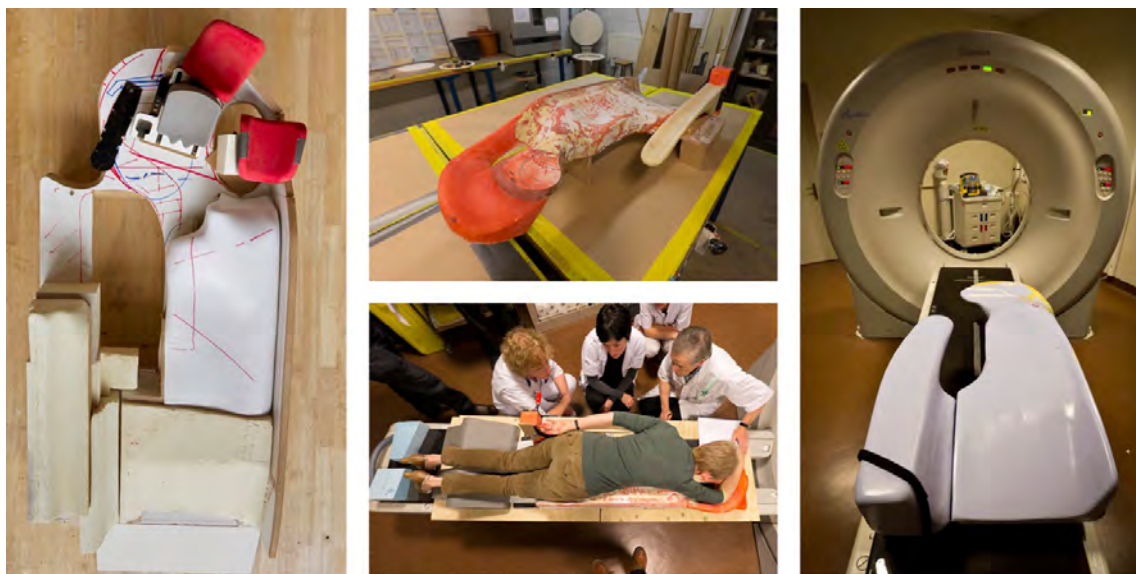


**Figure 2. Phase-I prototypes produced with basic material and low-fi tools.**

**Left: first iteration with polyurethane foam blocks, wood and recovered parts from a previous breast board. Middle: Middle: second iteration is hand laminated with polyester and fibreglass on top of the foam blocks. Right: Polyester prototype with adjustable hip and arm support ready for testing.**

## Phase II

The thin, resin infused fiberglass prototype resulted in improved beam access range and functionality. Further optimization was done by clay modelling to improve patient support surface (figure 3). Arm, hip-and head support resulted in better patient adjustability. The comparative study indicates improved patient comfort, beam access range and sparing of vital organs such as heart and lung.

**Figure 3. Phase-II prototypes produced with more advanced materials and skills.**

**Left: Modified support surface with modelling clay. Middle: Test of beam access range and arm support module. Right: Improved support structure and new indexed arm- and hip support. Used for comparative study.**

## Phase III

The new improved RIM fiberglass prototype resulted in a thin, strong yet lightweight device. The new support structure reduced weight, improved usability and precision (figure 4). The sheet metal arm- and hip module resulted in a wider range of positions and improved accuracy. The thin, fiberglass arm support enlarged beam access range. Clinical trial resulted in improvement of: dose-volume distribution in breast, sparing of untreated organs and patient position reproducibility in comparison with the standard prone breast board.



**Figure 4. Phase-III prototypes. Left: Improved positioning system for hip- and arm support. New carbon fibre support structure reduces weight. Middle: Patient on CT-simulation device. Right: breast board on treatment machine, used for clinical trial.**

# Discussion

To enable incorporation of new features to prototypes with greater ease and lower cost, identification of user needs and co-creation of the user is important for the development process of new medical products. Preferably, it should happen in an early stage of the design process (J L Martin et al. 2006). During phase I, we used small test sample sizes, since iterations followed quickly. consequently, there is no need for high quality and expensive prototypes. In phase II, more advanced techniques were used since prototypes required higher precision and functionality. These prototypes are more expensive and compelled more time to be produced but the requirements of the stakeholders are also higher. Phase III required a small series of identical devices. Therefore, prototype digitizing was required for design optimization and produce right- and left sided moulds. These prototypes require advanced skills and techniques and are more time consuming.

# Conclusion

When incorporating stakeholders early during iteration phases, it is possible to meet their requirements with a minimal effort of time and money. Each prototype technique and material have their own properties, requirements and use.  It is the task of the designer to choose the proper prototyping technique and material that suites the appropriate activity and context during every iteration phase.  By refining patient's comfort and position, we were able to improve medical performance and patient safety.

# Acknowledgements

# Conflict of interest

Ghent University owns the patent application entitled Radiotherapy Board and Couch [WO2015144654A1] filed on 25.03.2014 for which Wilfried De Neve, Bruno Speleers, Bert Boute and Liv Veldeman own the intellectual rights.

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# Wardrobe Adapted for Wheelchair Users

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## Keywords

 Wheelchair users, Accessibility, Autonomy, Furniture, Adaptation.

## Introduction

According to WHO data (2011), one billion people live with some disability, that is, one in seven people in the world has some kind of limitation of this characteristic. The UN, using WHO data (2011), warns that 80% of people with disabilities are residents of developing countries.

The wheelchair users are included in this context. They face obstacles of mobility, not only urban but also within their own homes, due to the lack of adaptations in them. These may be without the necessary reforms due to the high cost of any change. Also, they have difficulty performing daily tasks without the need for help, such as eating, storing their clothes and cooking. Thus, the objective was to create an assistive technology adapted to the wheelchair users to facilitate the act of keeping their clothes and that with it, the individual would have greater autonomy, self-confidence, independence, self-esteem and a better lifestyle.

## Methods

For this, Bruno Munari's (2013) design methodology was applied, which consists of steps to be followed to achieve the best solution to the imposed problem. Starting with the definition of the problem, a separation of the components of the same was made to collect data about the subject. After that, the data were analyzed and through creativity, we searched for materials and technologies that could be applied to the project. After that, possible alternatives to the solution of the problem were developed, which after being analyzed, started to be made in construction drawings, in order to choose the best alternative. With this method, we could understand some of the main problems faced by the users of wheelchairs and we could understand the adversities in the accessibility and mobility of the same ones.

In the continuation of this project, closed questionnaires were applied to the target audience, which were done through interviews, phone calls or e-mail. With the responses of the individuals, comparisons were made to better understand the common problems that everyone had in dressing. Also, a study was made of the anthropometric measurements of wheelchair users presented by Panero (2008), thus, we could use the correct comfort measures in the furniture.

# Results and discussion

Through the questionnaires it was observed that most wheelchair users do not pick up their clothes alone, and that despite the difficulty, they continue to have their traditional wardrobes in their homes because of the high cost of specific production of the required product.

With this, it was possible to make an analysis of the research problem and the data collection, allied with the answers obtained in the questionnaires. Next, the creative techniques of Attribute Listing and Mental Map were applied to generate alternatives to solve the problem presented and in addition, it was searched for materials, patterns and ornaments possible to be used in the project that were arranged in a Mood Board for a better visual analysis.

# Proposed Solution

Then, to solve part of the difficulty of the wheelchair users in the act of dressing, it was proposed the creation of furniture to store their clothes that is adapted to their needs, having an affordable price and thus allowing them to pick up their own clothes properly without causing any discomfort.



**Figure 1. Proposed solution**

The wardrobe was developed with measures that contemplate the ideal reach for these individuals. The furniture has been separated into two modules, allowing people to buy the two parts or just one depending on the need of each. The wardrobe is 50 cm from

the floor so that users can approach with the wheelchair by positioning the footrest underneath it. The width of the module is 65 cm, the total height is 130 cm and the depth is 65 cm. The door of the wardrobe is sliding and there are mirrors in it, and at the bottom there is a rubber strip to prevent the knee from being injured.
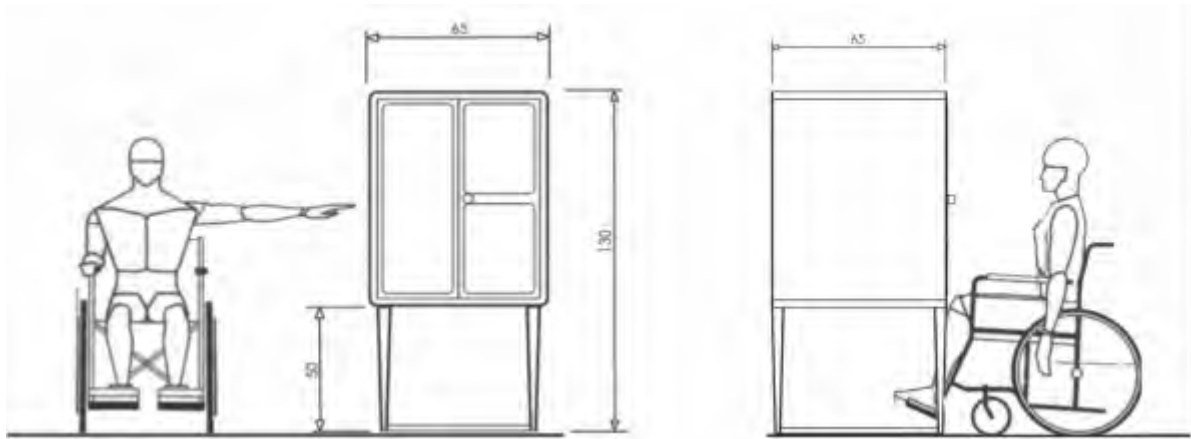


**Figure 2. Measurements**

One module has a pull down hanging rail so that the individual can hang their clothes without worrying about the height of the accessory. In this same module there is a sliding shelve with handle.



**Figure 3. First module**

In the other module there is a extractible holder for pants, which allows the individual to hang his pants apart from each other and allows them to reach it effortless. In addition, there are two drawers and two movable shelves for folded clothes, all with handles.

The outside structure of the wardrobe is MDF (Medium Density Fiber Fiber) with low pressure melamine laminate coating. The internal parts, such as shelves and drawers are, made in MDP (Medium Density Particleboard). The handles are made with ABS (acrylonitrile butadiene styrene) with metal cover, and the pull down hanging rail is made in aluminum.

The wardrobe is designed in colors that please both sexes and are easy to match with the dorms, having the white color as the base for all models and marsala, black, oak and ivory as the color of the doors and legs of the furniture.

**Figure 4. Second module**

# Conclusion

The creation of this furniture enhances the knowledge of the design area that is concerned with developing assistive technologies, which has a direct relationship with the health area. These technologies play a very important role for people with disability, so it is necessary to improve the studies and techniques so that every time, more efficient technologies are produced.

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# Delivering healthcare: A reframing tool to uncover the right problem to solve.

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## Keywords.

Innovation, reframing, healthcare, design tools.

## Introduction

The landscape of our healthcare system and the status of the patient are continually changing. Patients want to be part of decision-making processes and their resulting solutions; that is, they want to be engaged and active in their health and healthcare. Research shows that informed and empowered consumers have better health outcomes and their costs are lower (Green et al, 2015, p.3431).

It is recognised that person centred care often involves the identification of tension or contradiction between the service deliverer and the consumer (or patient) (Patterson, 2017, pp17; WHO 2015). This means that innovative healthcare providers need to be able to reframe their starting problem statements to ensure solutions consider all those involved, not just their own perspective. Reframing problems and building empathy for the people that matter, for example the patient and carer, are key disciplines of Design Thinking. We have created and tested a new tool, the Reframing Seesaw, to help articulate these contradictions within a Design Thinking framework, thus enabling the reframe to occur.

In this paper, we explore the following question:

Does the new tool – the Reframing Seesaw – help healthcare innovators to articulate the contradictions that exist between consumers and the system, with the potential to aid better problem solving?

## Background

Design Thinking, or human-centred design, has been used extensively within corporations worldwide to solve complex problems, drive growth, and scale successfully (Brown, 2009; Kolko, 2015, pp 67–71). It is also being used in Quality Improvement projects within the health care industry (Roberts, 2016). We refer to two key elements of Design Thinking in relation to healthcare: the involvement of the patient, and reframing of the starting problem to drive change.

The need to welcome the patient as an engaged consumer challenges the health system. Their needs often represent a point of tension with the system, and are often not

directly associated with efficiency, productivity, or cost savings. By articulating the underlying tension, innovators gain insight into the consumer perspectives that are key to driving change. This is known as *reframing the problem*, and is key to creating empathy-based solutions advocated in many current design approaches (e.g. Frame Creation: Dorst, 2015; d.school: Stanford Design School, 2011).

The first author designed a new tool to assist innovators to identify and articulate the contradiction that may exist when exploring a problem. The Reframing Seesaw (Figure 1) is used after qualitative research methods to explicitly communicate the tension or contradiction existing in the problem space. It highlights to the innovator both perspectives at play, and results in the original problem being reframed (or rephrased), thus potentially leading to better solutions.
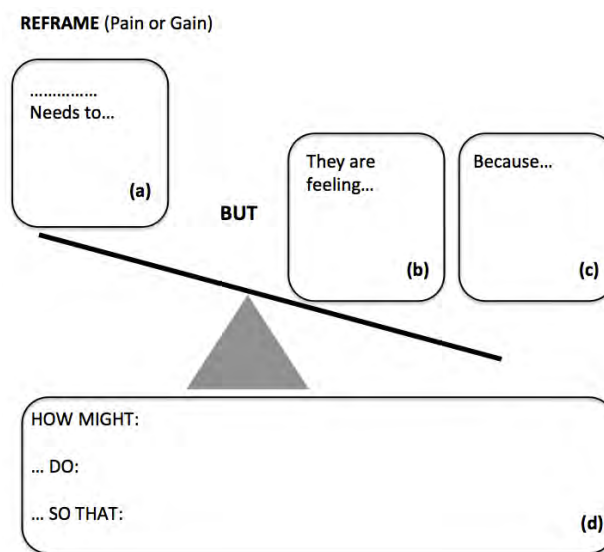


**Figure 1: The Reframing Seesaw whereby: (a) The starting, and often organization-focused problem, (b) The identified feeling of the consumer (persona) around a pain point, (c) Why the consumer is feeling that way (the tension when compared to (a)), and (d) What can we do to overcome the consumer-centric problem identified in (c) while also solving the often organization-focused problem identified in (a).**

## Methodology

To explore the research question and test the Seesaw tool (Cockburn and Thurgood, forthcoming), we describe two recent projects. In both projects, a Design Thinking framework was explored: artefacts were created (personas and journey maps) and the insights were summarised using the Seesaw tool. In both projects, patient and participant data were transcribed, codified, and subjected to thematic analysis.

The first project describes a one-day workshop held in June 2017. Ninety-two healthcare providers, patients, and representatives from other industries worked together in 11 teams, each exploring a hypothetical or real healthcare problem. The planned outcome on the day was for participants to consider how Design Thinking can be used to redesign system problems; specifically, to explicitly identify contradictions that exist between the end user and their health care delivery (or the system). At the end of the day,

participants completed a short evaluation questionnaire. A key question was, *"Does your understanding of the problem you explored today differ since the start of the day? If so, in what way?"* All participants completed the activities using the aforementioned design tools, and 71 of the participants completed the evaluation questionnaire.

Our second example describes a current project being undertaken within a large Not For Profit hospital investigating the education of patients prior to chemotherapy treatment. The first author is currently working with a small in-house team. Fourteen patients were interviewed to understand their needs in initial research, and a possible solution is now being piloted.

# Findings and Discussion

The results from both projects provided promising support for our research question.

From the one-day workshop, of the 71 responses to the question outlined in the methodology section, 62 answered *"yes"*. The key themes relating to the positive response indicated that their starting problem was now:

- Bigger and expanded

- Inclusive of patient needs

- No longer just about solving the medical treatment

- More positive, focusing on motivators rather than barriers

Data collected in the workshop showed that 77% of teams identified that tensions between the needs of the consumer and their health providers existed. Additional feedback included that the tools and Design Thinking framework, including the Reframing Seesaw, enabled them to reframe problems. Eighty-eight percent of the workshop participants completing the survey indicated that they now had a different understanding of their starting problem, and the resulting themes indicated this new understanding helped them to consider alternate possibilities involving the patient perspective.

In the second project the initial interviews with patients revealed that connection, familiarity, and comfort were key needs of the patients. This is in contradiction to the organizational-want to deliver technical information about the medication and side effects. The Seesaw tool enabled this small team to clearly see what was needed for the patient while also considering the wants of the system (Figure 2). The service being piloted is a reflection of the emotional needs of the patient, rather than just the technical needs of the system. Feedback on the pilot currently being tested has been very positive both from patient and staff perspectives.

While our data to date is positive with regard to the utility of Design Thinking and the Seesaw tool in the healthcare sector, the authors recognise that more data is required to develop and validate the Framework and Seesaw tool further. It is intended to trial

and develop the Seesaw tool in other projects, including those in sectors other than healthcare, and to explore the utility of the Seesaw over time.

## Conclusion

Both the project described in this paper support the use of the Design Thinking
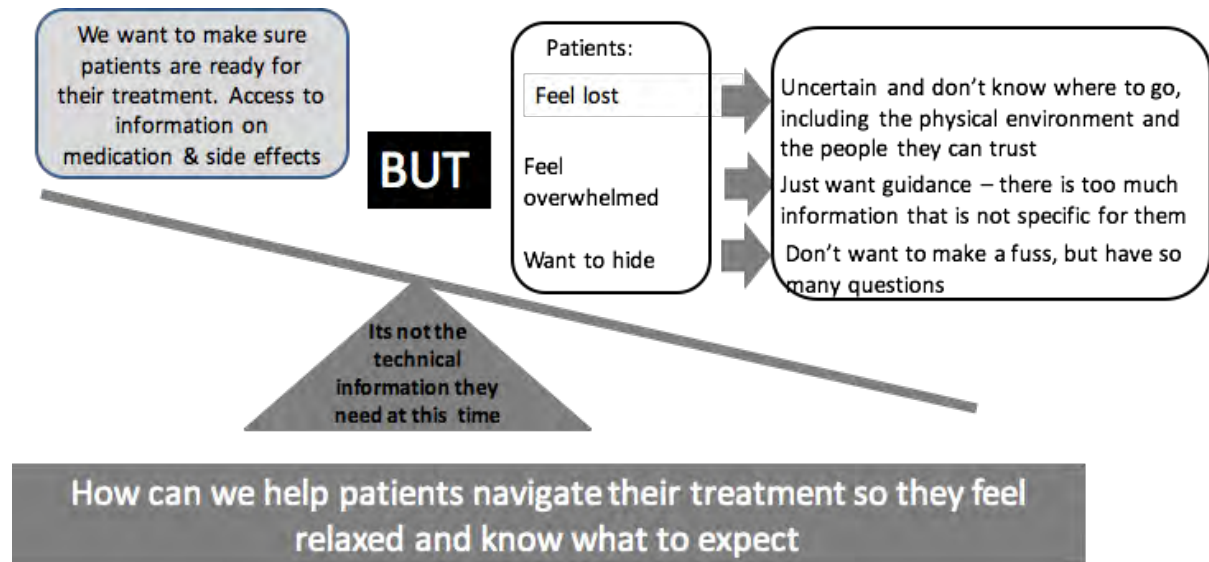


Figure 2. The Reframing Seesaw showing the identified tension around the system need (to give treatment information) versus the patient and family need of connectedness, readiness, and comfort.

framework, including the new Reframing Seesaw tool. Identifying the tension that exists between system and consumer resulted in the end user needs being considered, rather than just a myopic view of system wants. The Reframing Seesaw has promising potential that may lead to desirable healthcare solutions that are embedded in empathy for the people that matter.

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# Design Anthropology and the medicalisation of ageing: Reflections on Designing for mild cognitive impairment

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## Keywords.

Mild cognitive impairment; design anthropology; ageing; co-design

## Introduction

Over the past decade, 'designing for dementia' has become increasingly prevalent in the design world. While journal articles and books show a corresponding interest among designers in the practical and ethical challenges of involving people with dementia in the design process (Mayer & Zach 2013, 540-545; Hendriks, Truyen & Duval 2013, 649-666; Astell, Alm, Gowans, Ellis, Dye & Vaughan, 2009, 49; Barnett 2000), there has been relatively little engagement with 'medicalisation' as a potential issue in this context. Recent changes to the diagnostic criteria for dementia have redefined 'normal' ageing and created entirely new categories of cognitive impairment (Katz 2012, 1-14). Designers are increasingly involved in the development of products and services for 'mild cognitive impairment' (MCI), a relatively new diagnosis that describes the ambiguous stage between 'normal' age-related decline and dementia. The disputed category has generated a user-group with unmet 'needs' for which a number of products have already been designed, including wearable technologies (Dibia, Trewin, Ashoori & Erickson 2015, 401-402), companion robots (Schroeter, Mueller, Volkhardt, Einhorn, Huijnen, Heuvel, Berlo, Bley & Gross 2013, 1153-1159; Gross, Schroeter, Mueller, Volkhardt, Einhorn, Bely, Martin, Langner & Merten 2011, 2430-2437), smartphone applications (Das, Seelye, Thomas, Cook, Holder & Schmitter-Edgecombe 2012, 399-403; Solanas, Martinez-Balleste, Perez-Martine, Pena & Ramos 2013, 19-27), and assisted living technologies (Dankl 2017, 30-42).

Dankl (2017) recently suggested that design has a tendency to perpetuate negative cultural conceptions of ageing by overemphasising the medical significance of cognitive and physical decline, rather than drawing on more holistic models of ageing. She argues that the methodological lens of design anthropology may contribute to a participatory transformation of images and preconceptions of ageing by encouraging real-time critical reflection on how design impacts on the public discourses that shape the ways in which older people are viewed. In this paper, we reflect on how we have sought to integrate an experimental design anthropological approach into an ongoing project called 'Living Well with MCI' in which the brief was to develop an 'interactive online resource' for people with MCI and their families. In this project, a UX designer worked closely with a researcher who was doing a PhD in design anthropology (Figure 1).

**Figure 1. A designer and an anthropologist facilitating a co-design workshop with MCI participants.**

## MCI and the Medicalisation of Ageing

MCI is typically described as "an intermediate stage between the expected cognitive decline of normal aging and the more-serious decline of dementia" (Mayo Clinic 2017).While supporters have argued that the value of the MCI category rests in its ability to predict Alzheimer's disease, many people diagnosed with MCI do not progress at all (Sachs-Ericsson & Blazer 2015, 2-12). One consequence of recent changes to the diagnostic criteria for dementia is that the minor cognitive changes that were considered 'normal' just thirty years ago have been redefined as pathological (Katz 2012, 1-14). The MCI category is therefore linked with the expanding conceptual boundaries of dementia and the medicalisation of otherwise cognitively healthy individuals (Rose 2009, 66-83).

Design anthropology is a recent attempt to incorporate anthropological inquiry with design processes in order to generate new knowledge as design projects unfold (Gatt & Ingold 2013, 139-58). Gunn and Donovan (2012, 1-16) have suggested three ways of framing the relationship between design and anthropology within the context of a design project:

# A Design Anthropological Approach

| | | |
|---|---|---|
| design Anthropology *(dA)* | The theoretical contribution of the research is more for anthropology than it is for design. | E.g. The design project is itself the subject of anthropological inquiry. |
| Design anthropology *(Da)* | Research is conducted for and in the service of design. | E.g. ethnographic fieldwork is carried out to generate insights and implications for design. |
| Design Anthropology *(DA)* | Research is balanced in such a way that each discipline feeds into and learns from the other. | E.g. The anthropologist and designer work together on a design project and inform each other's thinking. |

**Table 1. Three ways of framing design anthropological engagement in relation to a design project. Adapted from Gunn and Donovan (2012, 1-16).**

The third mode of engagement, DA, best represents the nature of the design-anthropology relationship within the Living Well project. The PhD researcher attempted to integrate anthropological inquiry by carrying out an ethnographic study in dementia research laboratories and memory clinics to better understand (and report back on) how MCI is identified, evaluated, diagnosed, studied, and treated. This field material became the basis for critical reflection on some of the complexities of 'designing for MCI'. It highlighted how experts struggled to define and label cognitive decline, understand its causal mechanisms, and neatly delineate the boundaries between 'normal' and 'pathological' memory. The designer in turn taught the anthropologist a wide range of design skills, from facilitating co-design activities to developing and testing design concepts (Figure 2).

**Figure 2. Developing the online resource during a crit-session.**

## Conclusion: Towards a Participatory Transformation

In moving away from a widespread emphasis on design *process*, in which researchers discuss the challenges of designing with people who are 'cognitively impaired', a design anthropological approach instead focuses on how we might design with greater critical awareness of such labels and how they act in the world (Hacking 1999). By opening up space for critical reflection on how design can perpetuate and shape public discourses, a design anthropological approach has informed important decision-making processes on the Living Well project by facilitating a heightened reflexivity to underlying cultural assumptions and conceptual frameworks around 'the ageing brain'. This approach recognises that design may itself be implicated in the processes that perpetually frame ageing in terms of (cognitive and physical) deterioration, and that, as a future-making practice, design projects ought to proceed with caution. Indeed, in a context where the science is incomplete and contested, designing 'for' MCI may inadvertently contribute to a premature 'hardening of the category' (Whitehouse & Moody 2006, 11-25). To the extent that anthropology is concerned with the social forces that give rise to new medical realities, the methodological lens of design anthropology can inform decisions about which realities we want to live with in the future (Gunn & Donovan 2012, 1-16).

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# Giving people living with dementia a strong voice: reflecting on the role of design to create enabling activities

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## Keywords

design, dementia, design recommendations

## Designing for and with people living with dementia

Dementia is named by the WHO as the leading cause of disability globally (WHO, 2017). Not surprisingly, more general attention and funding is being allocated to support individuals living with this condition.

The role of design is being increasingly recognised. In part, design has always played a role particularly in relation to design of dementia friendly environments to help compensate for some of the perceptual challenges individuals might face and mitigate against some of the symptoms individuals living with dementia experience (Brawley, 1997). However as dementia is diagnosed at an earlier point, and more people live in the community, the design of products and environments and services is seen to be even more integral (Fleming & Purandare, 2010).

As a consequence, more designers are working in this field to support the development of products, environments and services to compensate for some of the challenges these individuals face (Rodgers, 2017). However, the challenge is that rather than offering new perspectives and bringing an alternative way of thinking about dementia to enable individuals to live more independently, designers are following existing medical paradigms which over-emphasise the diagnosis, focus on disability and loss, and label individuals as patients rather than as partners in the design process.

This opinion piece questions, reflects on, and highlights some of the challenges that prevent the potential of design being realised in the context of people with dementia to create products and services that do not further stigmatise individuals but that celebrate and tap into the innate resilience individuals possess. We begin by reflecting on the current state of the art in the context of design and dementia and then highlight some of the dangers that an over-reliance on the medical model presents. We conclude with considering some of the ways that designers of the future may wish to learn and draw inspiration from people with dementia and the positioning of dementia as a disability (social model of disability) than purely a disease process.

Dementia is an umbrella term for over 100 conditions that share similar symptoms including loss of short term memory, challenges in communication, planned purposeful movement, and higher processing skills (Vink et al, 2003). Dementia is the leading cause of disability with projections suggesting dementia numbers to increase fourfold in the vicinity of 135 million by 2050 (Alzheimer's Disease International, 2013.). At present, there is no cure for dementia and health-policies globally have placed emphasis on supporting individuals to find ways to live well with the condition.

# Main barriers to higher quality of life for people living with dementia

Here we summarise the main barriers for effective support.

**A homogeneous group perspective and focus on disease**: Whilst people with dementia are not a homogeneous group and whilst individuals can live with dementia for decades at present there is still a tendency to very much focus on the disease and the losses individuals experience rather than seeing the person's individual interests and the assets and strengths that they have developed over a lifetime. The impact of dementia on the person is not only a consequence of the physical condition but individuals are equally disabled by the prevalent preconceptions, lack of understanding and assumptions that are made in respect of the condition. In the words of one person with dementia:

*"People get to hear the word dementia and it's all lumped together and they think you are not finished. You are not finished at all."* (quote from participant living with dementia).

# Medical model neglecting everyday life experience

Part of the challenge is that dementia is commonly described within the context of the medical model and of the changes that occur in the brain tissue rather than seeking to understand the impact of dementia on the person on a day to day basis and on activities of every-day living. As dementia is conceptualised under this disease model which places emphasis on decline, the challenge is how to identify, engage with and meet individuals living with the condition. Medics are gatekeepers. Broader health and social care providers act as filters granting or denying access to individuals. Consequently, it can be difficult at times to hear the voice of people with dementia. This is compounded by the stringent ethical frameworks that deem people with dementia as either with or without capacity and the complexities then of involving individuals in research and of building understanding of the world from their perspective and of the opportunities and of the challenges that dementia can present.

# People living with dementia not given a voice

This narrow view does not only manifest itself in the research arena but in every element of the dementia care pathway from how individuals are addressed, the way information and to whom information is provided and the way products and services are designed. People living with dementia are hardly addressed and equipped with the skills to manage everyday life, leading to both visibility and invisibility, and a self-fulfilling

prophecy. If individuals are not consulted and provided with the tools to be able to undertake everyday meaningful activities, they lose the skills to be able to continue to engage. The little spoken about psychological consequences of living with dementia and its impact on mood, and the increasing social isolation that individuals can experience, means that the symptoms of dementia are compounded.

Yet people with dementia, and research about them, tells us that when people are supported to build community connectivity, individuals can maintain valued life roles and experience wellbeing.

Design in this context has a key role to play in enabling individuals to access and engage in meaningful activities such as the CIRCLES project to include people living with dementia (NDTI, 2014), music based activities such as touchscreen ensemble music (Favilla & Pedell, 2014) and music therapy (Ingram, 2012).

However, what we see commonly is an over emphasis on tracking, monitoring and brain training. On products that rather than de-stigmatizing dementia serve to reinforce some of the stereotypes that exist and that over-emphasise/ risk and risk culture.

In order for design to realise its potential in this area need a power shift. Historically much focuses on later stages of dementia rather than seeking to empower and support people in the early stage of the condition or people experiencing mild cognitive impairment. The key here is to find ways of listening to people and to creating products and interventions that help them to maintain their part take in social activities.

# Concluding recommendations to designers

**Adopt a reflexive approach:** Recognise own motivations and the assumptions that most designs for people with dementia are driven by.

**Co-design with people living with dementia:** be prepared to see individuals' creativity and resilience, have confidence in design and creative practice as methods and modes to engage and to offer individuals structures and vehicles through which to be heard.

**Formulate evaluation criteria:** Re-write with people how we should decide what success means and how we should evaluate this.

**Focus on positives**: Be prepared to let go fear and fearfulness and hear the positives instead. Understand what people have gained as well as lost and recognise that people are people and life has complexity—people are not just coping with dementia but are living a life. This includes humour.

**Challenge ethical frameworks:** when autonomy is denied, stigmatising language used and gaining feedback should take other ways. Seek to shape ethical processes around the person rather than expecting the person to fit into rigid ethical processes.

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# Discourse and collaborative design: exploring a critical approach to community engagement for design research insight

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## Keywords.

CPAP, human-centred design, post-structural methodology, design research, community engagement

## Introduction

The design of personal medical devices typically focuses on usability and function, both concepts heavily steeped in powerful scientific and clinical knowledges and practices. When social meaning is considered, it is usually from the perspective of individual users, even though discourses circulating among the broader community are vitally important and influence uptake and use. This research seeks opportunities to draw in human influences, beyond talking to users, on the uptake of devices. Continuous Positive Airway Pressure (CPAP) breathing support devices are the gold standard treatment for Obstructive Sleep Apnoea (OSA) (Figure 1) and an example of a personal medical device used in the home. The rates of usage both in hours used per night and long-term continuation remain low (Worsnop, Miseski, and Rochford 2010, Arfoosh and Rowley 2008). This is despite robust evidence for clinical success of the treatment in reversing apnea events and associated comorbidity risks (Shapiro and Shapiro 2010, 324). Patient difficulty maintaining ongoing use of the CPAP devices within the broader social context of their own lives thus presents a significant barrier to the well documented benefits of OSA treatment (Shapiro and Shapiro 2010, 335).

**Figure 1. CPAP mask showing differences in material discourses between hospital and home settings, both settings in which it is commonly used (Research images similar).**

## Theoretical frameworks

Foucault's discourse is conceptualised not "…as signs… but as practices that systematically form the objects of which they speak" (Foucault 1972, 49). In Foucault's view, the individual is constituted historically rather than a pre-existing entity (Foucault 1982). Thus, the subject positions that result from the actions of the power-knowledge complex, both in how people are acted upon by others but also how they come to understand themselves are also constituted discursively (Foucault 1982, 781). This research brings these ideas into a design process through a new method of community engagement. Taking a critical approach to currently accepted formulations of how a human-centred design research study is situated also challenges which "subject positions" are sought for involvement or partnership. Combining Foucault's methodological tools with design probes created a hybrid approach extending into community and relational understandings of personal medical product issues, leading to the identification of a broader range of future design possibilities. Methodologically, this research contributes to design research as a discipline, design for health and design for chronic illness specifically.

# Mapping

Figure 2 shows part of a discourse map created from a CPAP therapy mask.
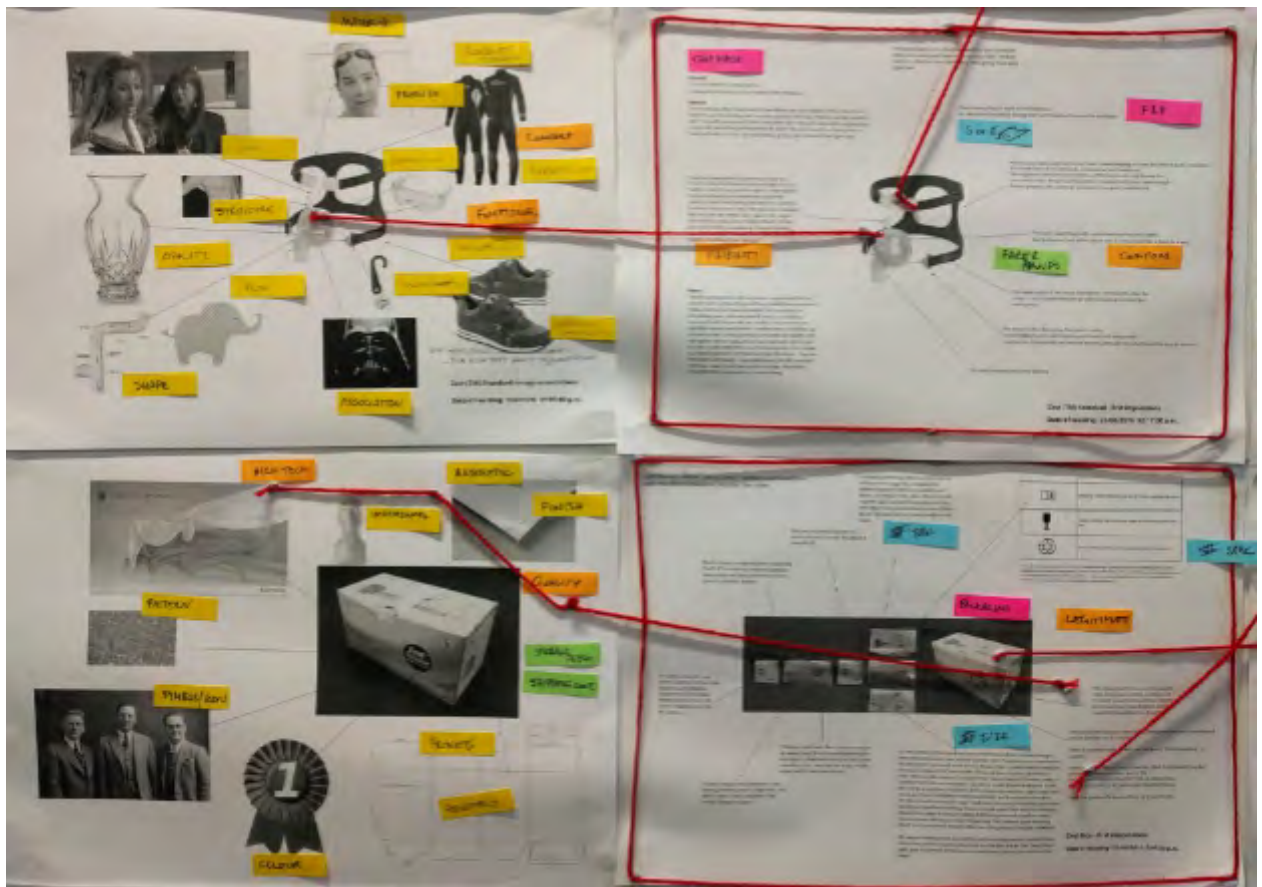


**Figure 2. Mapping and identification of Foucault's discourse elements (see Foucault 1972) to help make visible formative knowledges and practices**

While the material effects of manufacturing, legal, quality and health knowledges and practices were apparent in examining the physical mask, what was less evident was the human element or the user. For example, if one were to imagine removing the mask from the centre of the map illustrating the knowledges and practices shaping the mask, it's hard to imagine any other kind of mask that would sit in that space that would be very different due to the powerful discourses operating. This highlighted that to challenge the form of the mask, it would be important to find a way to resituate by it making the knowledges and practices that have shaped it more visible and challenge their inevitability.

# Resituating the mask

Public exhibition has been proposed as a way of engaging with communities about the social contexts that influence the meaning of devices in the lives of users (Blythe, Yauner, and Rodgers 2015). Design in this context may be used as a synthesis and communication tool to improve the visibility of knowledge-power effects in mask design for community discussion and engagement.

**Figure 3. Mask probe resituated from an environment governed by clinical knowledges and practices to one still governed by different health discourses (research images similar)**

As shown in Figure 3 and Figure 4 probes were developed to imagine a mask situated in and reflective of very different sets of discourses.

**Figure 4. Mask drawing on home garden elements a situation where health regulation is largely absent (research images similar).**

## Community engagement

A series of five public exhibitions in three Auckland community markets presented a typical CPAP therapy mask with typical connecting components. This was contrasted with mask probes and design concept imagery in a market stall.

**Figure 5. Auckland Market exhibition stall.**

Participants were asked what they would think or feel if they were asked to wear a standard CPAP therapy mask. To allow a physical construction of participant responses, a set of cultural probes were developed as shown in Figure 6.

**Figure 6. Cultural probes included images, emoticons and phrases.**

# Conclusions

This method has accessed valuable design research input on social and relational influences in the community that impact attitudes towards breathing therapy masks. These new inputs are otherwise inaccessible to current forms of research which has resulted in new insights that have not been previously recognised. This research provides a working example of how a philosophically driven approach to collaborative design can be applied in a practical design research project to produce results that have never been considered before.

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# Design for health: Experience of women-based food innovation initiative to overcome nutrition related health issues in Sri Lanka.

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## Keywords.

Food, Innovation, Non-communicable diseases, Women entrepreneurs.

## Introduction

Sri Lanka is facing a double burden of malnutrition in the recent times. While there is an epidemic of nutrition related non-communicable diseases (NCDs) such as diabetes, obesity, and cardio vascular diseases (IPS, 2011), more than 20% of the children are suffering from under-nutrition (WHO, 2017). Research shows that food related NCDs have caused exorbitant numbers of Sri Lankans suffering from those diseases, increasing incidences of hospitalization, 90% of total treatment cost, and about one fifth of all deaths (Jayawardena et al., 2014). Like many other countries, the leading cause for the explosion of these NCDs has been eating loads of processed (junk) food and unhealthy lifestyles. This is inevitable as Sri Lanka experiencing rapid socioeconomic changes including income growth, urbanization, working women etc. However, the NCD epidemic that is looming can be handled with prevention. Both the rich and the poor, particularly children need to be taught how to choose and eat wisely.

The challenge is how to innovate healthy food for busy urban lifestyles in a country having a poor innovation record. Out of 127 countries, Sri Lanka ranked 90th in the Global Innovation Index in 2017 scoring only 29.9 of a 0-100 scale (Dutta et al., 2017). In order to overcome these challenges, a government agency took an initiative targeting rural women in healthy food preparation using traditional recipes. The program initiative was to establish a food court in 2012 employing 20 rural women entrepreneurs. The aim of this study is to investigate the outcomes, and challenges of this initiative.

## Methodology

This research employed case study approach, including all the women entrepreneurs in the survey to get detailed information about the program. At the time of the survey in 2016, there were 65 women entrepreneurs attached to the program operated in two locations—Gannoruwa and Peradeniya in Kandy District of Sri Lanka—and 53 of them responded to the survey. Data was collected using a semi-structured questionnaire, interviews with farmers, women entrepreneurs and customers, and key informant

discussions with technical and administrative staff, supported by researchers' observations.

## Results and discussion

The program strictly adheres to promotion of nutritionally balanced and healthy food using local recipes to tackle the double burden of malnutrition. It is a total value chain approach starting from small-scale local farmers, trained and skilled women professional cooks (entrepreneurs) to final consumers. The objective of the program was to design and serve food having characteristics of both 'fast food' found in multinational fast food franchises (i.e. fast, convenient, and tasty) and 'local food' found in traditional households (i.e. local ingredients, cheaper and healthy). Food recipes are co-created using mostly tacit knowledge of rural women entrepreneurs, and explicit knowledge of nutritional and business experts attached to the government agency. No food additives are used as they are prepared only to meet the daily customer demand. The food court also acts as a business incubator, where women get training and try out innovative food recipes. Accordingly, more than 80 food items are produced every day that can address the double burden of malnutrition in Sri Lanka.

Farmers are requested to grow vegetables & herbs (e.g. Aerva lanata, Senna auriculata,), grains & pulses (e.g. Panicum sumatrense, Eleusine coracana) and fruits (e.g. Aegle marmelos, Caryota urens) having Ayurvedic medicinal properties to prevent NDCs. Through extension services, farmers are encouraged to produce these crops using organic farming principles, thus to maintain the safety of the food ingredients used in preparations.

As for consumers at the food court, they can find various food items prepared directly from locally available fresh ingredients. The promotion of local food items and providing tips on how to prepare them, not only helps farmers and women entrepreneurs earn an additional income, it also gives consumers an opportunity to learn new recipes to prepare healthy local food.

The outcomes of the program is overwhelming as there is high consumer demand particularly from urban working mothers and university students. The food court has offered new opportunities, particularly for the economic empowerment of women, who often come from poor rural communities where they are confined to the domestic sphere. They have been able to reach higher income and social status comparative to many socioeconomic standards prevailing in Sri Lanka.

## Conclusion

The program has been able to create livelihoods in food preparation for rural women by developing their technical knowhow and entrepreneurial skills, design and promote healthy convenient food among busy urban consumers, and provide stable market for farmers' harvests and women's food preparations. One of the key success factors of the program is its integrated approach of innovation, health, training, employment and empowerment. However, there are challenges including getting rural women, with less educational standards, in food design thinking process, maintaining food safety,

measuring real health benefits of the food, and prompting these food among younger generations in the society where malnutrition is prevalent. This paper finally makes recommendations to overcome these challenges.

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# Co-designing to understand the tracheostomy product experiences of long-term tracheostomy users.

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## Keywords.

Tracheostomy, co-design, workshops, critical design

## Introduction

Tracheostomy product designs have barely changed in 100 years (Szmuk et al. 2008). Existing designs focus on cost effective clinical functionality, often at the expense of user experience. Users face physical and emotional distress because of their tracheostomies. Ongoing maintenance, shame and stigma impact users' quality of life, yet there is little research into their experiences and relationships with tracheostomy products (Gilony et al. 2005, Morris, M., and Afifi 2013). This research aimed to capture tracheostomy users' stories, advocate for greater consideration of their needs, and challenge historic stagnation in tracheostomy design.

## Methodology

Hour-long co-design workshops consisting of two creative activities were facilitated by designers and executed in collaboration with tracheostomy users (Sanders and Stappers 2008). The first activity was a group brainstorm about improving tracheostomy products. The second activity asked participants to evaluate and select prototyped tracheostomy components to create new designs (Figure 1). Participants had used their tracheostomies for one to twenty-five years and ranged in age from twenty-five to seventy-five. Patterns of meaning were extracted from workshop findings using thematic analysis (Braun and Clarke 2014).

## Results

Initially participants became distracted with tangential conversations about their tracheostomy experiences, rather than engaging directly with workshop activities. Later, they identified flaws with existing designs but found generating ideas for improving them difficult. Participants were quick to dismiss new ideas, citing multiple reasons each would not work. In general, participants fixated on functional issues and struggled to imagine how concepts could be developed into functional designs. A few participants were open to new ideas and able to identify prototypes with potential for development.

Figure 1. Examples of prototypes (annotated with participant feedback) used as probes in the co-design workshops.

Engaging with tracheostomy users helped build a better understanding of their experiences.

Key workshop findings were categorised as follows:

## Eagerness to share

Participants were eager to discuss shared experiences, and improve the experiences of others. For many this was their first chance to share with people who could relate. Sharing appeared to be cathartic, especially in light of the isolation many experienced because of their tracheostomies.

# Isolation and lack of support

Several participants remembered feeling isolated while adapting to their tracheostomies. Clinical support was described as inadequate for easing their struggles. They believed they were neglected because tracheostomy is relatively uncommon, and their conditions were no longer acute.

# Resistance to change

Because participants had become competent at tracheostomy care through long-term use, they did not believe improved products would benefit them. Despite dissatisfaction with their treatment and the available products, they were resistant to change. Long-term tracheostomy use may have cemented participants' conceptions of what tracheostomy products should be.

# Identity

Participants were afraid of being defined by their tracheostomies rather than their personalities. However, they also expressed a counterintuitive desire for their tracheostomies to look 'like tracheostomies' rather than being disguised. For some, their tracheostomy tubes were symbols of the adversities they had overcome.

# Product choice

While participants were dissatisfied with lack of product choice, they believed a 'good' design would remove the need for choice altogether. Their views did not reflect the diverse needs and preferences uncovered during co-design sessions. The knowledge that healthcare product design is largely cost-driven, may have discouraged participants from expecting greater product choice (Barber 1996).

# Conclusion

To capture findings and convey participants' experiences, a series of critical design artefacts was produced illustrating problems they identified with existing products (Boer, Donovan, and Buur 2013, Koskinen et al. 2011, Malpass 2015, Mazé and Redström 2009). These artefacts used familiar colours, textures, and materials to guide observers' interpretations (Figure 2). The goal was to make aspects of tracheostomy users' experiences immediately comprehensible to observers, regardless of their tracheostomy knowledge.

**Figure 2. Critical design prototypes conveying flaws of existing tracheostomy products. From upper left to bottom right; sandpaper strap conveying the discomfort of wearing a tracheostomy tube, paper strap conveying the problem of existing straps disintegrating with use, strap fastened with padlocks to communicate the difficulty of fastening existing tracheostomy tubes, hi-visibility tracheostomy strap conveying the idea that tracheostomy tubes draw unwanted attention.**

This research built a deeper understanding of long-term tracheostomy users' experiences. Findings about users' experiences of isolation may help clinicians better cater to their need for more comprehensive and empathetic support. Understanding how tracheostomy products impact users' lives and identities may encourage designers to offer more options that are sensitive to users' individual needs. Critical design artefacts promote empathy for tracheostomy users and encourage future efforts to address their needs.

In future, research using a more comprehensive co-design strategy with more sessions run over a longer time period may provide opportunities to explore concepts in greater depth and give participants a stronger sense of ownership in the research process. Including a wider range of participants may also provide valuable insight, particularly new tracheostomy users who may be more receptive to change and more radical ideas.

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# The refuge project: Designing through health, architecture and landscape

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## Keywords

transdisciplinary pedagogy, domestic violence, empathy, design

## Introduction

Links between healthcare, architecture and landscape architecture, while sometimes evident in practice, are less obvious in academic contexts. Design schools focus on spatial and environmental issues and schools of nursing focus on patient care. However, there are recognised benefits when teaching and learning initiatives transcend traditional disciplinary boundaries.

This project facilitated an authentic learning experience allowing students to find meaningful connections between their previous views and experiences and emerging understandings derived from encounters in the 'real world' of practice. Authentic learning was scaffolded and promoted self-directed opportunities for learners to address new challenges, apply new knowledge and skills to real-world scenarios, and work towards attainment of competency (Quarles, et al, 2009). The intersection between lived experience and disciplinary knowledge provided the context for authentic learning to occur (Tochon, 2000).

This project provided the opportunity for three disciplines – nursing, architecture and landscape architecture to engage in authentic learning experiences that facilitated development of empathy. In healthcare, empathy is considered critical to therapeutic engagement with clients and fundamental to safe and effective clinical practice. In architecture and landscape, debate on empathy and space is largely focused on how form and aesthetics affect experience. Because architecture exists at the intersection between natural and human, between biological and cultural worlds, it is vital that it responds to intellectual developments in other disciplines, such as nursing to innovate for more focused design solutions.

## Aims of the project

The aims of this project were to: (a) explore the impact of a collaborative authentic learning opportunity situated in a health, social and design space; and (b) determine whether this approach influenced empathic responses to problem based scenarios.

# Methods

## The intervention:

Academic staff from the schools of nursing, architecture and landscape architecture designed and implemented subjects that ran separately and concurrently but allowed for students from each school to collaborate on the development of a women's refuge. Nursing students enrolled in a twelve-week women's health subject framed within a Feminist framework in the context of a Social Model of Health. In this subject, family violence is a key topic. Some students undertake work-based placements in women's refuges. Architecture students undertook an eight-week subject exploring refuge spaces for survivors of domestic violence through a series of investigative exercises, architectural precedents and sessions with refuge workers and managers. Landscape architecture students completed a subject in which the first eight weeks involved collaboration with architecture students exploring landscape as refuge.

Nursing students provided architecture and landscape students with insights into health and social issues of women and children who have experienced family violence or and/or homelessness, the aim of this exercise being to influence the spatial design of a refuge. By sharing knowledge, ideas and experiences and through direct contact with stakeholders, new overarching frameworks and paradigms were created. Subsequently, over a four-week period, the architecture and landscape students produced a series of design proposals for a women's refuge to address the situations described.

The architecture and landscape students worked collaboratively on two assessment tasks within their courses: a poster outlining spatial scenarios (situations which would occur in a refuge) and a design guide which presented 10-12 design criteria for design excellence in refuge spaces.

# Data collection:

Following ethics approval, students from each discipline were invited to participate in a mixed methods study. Comparisons in empathy levels were made at baseline (pre-test) and after completion of the learning experience (post-test) to identify the extent to which this authentic work-integrated learning activity and collaboration between the three disciplines influenced students' empathy towards women who are homeless and/or victims of family violence. Focus groups were then conducted to explore a) the impact of the project on student's agency to enact personal and social responsibility; and b) how the project may be further developed to have a measurable social impact and actively contribute to local communities.

Participants' empathy levels were measured using the Comprehensive State Empathy Scale (CSES) (Everson, Levett-Jones & Lapkin, under review). Socio-demographic data was also collected at the commencement of the study. The CSES includes two scenarios (titled Vicki's and Sarah's story) and 30 items categorised into six subscales (Empathic concern, Distress, Shared affect, Empathic imagination, Helping motivation and Cognitive empathy). Each CSES item is scored using a five-point Likert scale with

response ranges from 1 (completely untrue) to 5 (completely true), with higher scores indicating higher empathy levels.

Participants were asked to respond to each of the CSES items based upon their attitudes and feelings toward the person described in the accompanying scenario. The CSES scenarios were developed specifically for the current study. They describe the experience of a young woman who has experienced domestic violence. The pre-post scenarios are essentially the same except for minor details such as the woman's age and background. The scenarios were informed by literature describing the lived experience of domestic violence and they were reviewed by an expert panel. The images included in the scenarios were of two different women who appeared despondent.

## Results

A total of 49 students from a cohort of 49 participated in the study, giving a response rate of 100%. Participants included 25 nursing students, 12 architecture students and 12 landscape students. Preliminary results of data analysis suggest that the project has had positive outcomes for all students; and at the conference specific details from the qualitative and quantitative data analysis will be presented.

## Discussion

Empathy is one of the strongest negative correlates of prejudice (Pettigrew and Tropp, 2008) and premised on this understanding, educational experiences designed to elicit empathy are increasingly being implemented in undergraduate curricula (Batt-Rawden, Chisolm, Anton & Flickinger, 2013). The project described in this paper enabled a layered approach to authentic learning that allowed undergraduate students from three seemingly disparate disciplines to view the experiences of women who have survived domestic violence and homelessness from an individual and shared disciplinary lens. The rich insights uncovered by this novel learning approach resulted in the emergence of new empathic understandings and insights.

## Limitations and implications of study

This project is limited by the single context and relatively small sample size. Although the results are thus far encouraging from anecdotal evidence, further research in other settings and with other cohorts is required.

## Conclusion

This innovative educational project allowed learners entree into the lived experience of domestic violence. It enabled them to reflect on a survivor's perspective, and consider their feelings, perspectives, needs and concerns. The transdisciplinary interactions reinforced these emergent understandings and assisted students to translate their learning into a series of proposals for a women's refuge. The results from our study attest to the impact of these types of authentic and meaningful transdisciplinary learning experiences.

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# Prototyping an emotionally responsive hospital environment

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## Keywords

hospital; spatial design; design for health; prototyping; co-design

## Introduction

In this paper, we present a project based on a spatial redesign at major city hospital in New Zealand. The project aimed to improve the public waiting area located outside an intensive care unit (ICU). As an environment, the area is characterised by extremely high levels of stress and anxiety, but was often described by families and staff as 'impersonal', 'unfriendly' and 'uncomfortable'. The project focuses on how a design-led approach was used during the 'requirement gathering' phase for a potential refurbishment, engaging users of the space, collecting insights about their experiences, developing concepts for improvement and thereby generating buy-in from hospital stakeholders. In particular, we explore how making or prototyping as design practice was used to inspire new ways of thinking about the space to respond to the functional and emotional needs of its users.

Afforded by our location onsite at the hospital, we embarked on an opportunistic journey to draw together the stories and opinions of unrelated individuals - all of whom had a connection to the waiting space - and responded with critical design artefacts and possible solutions (Reay et al. 2016) (Figure 1). Our main agenda was to bring focus to the 'fuzzy front end'(Sanders and Stappers 2008), asking users 'what should an appropriate hospital family waiting area be like?' Prototyping future spatial layouts and experiences throughout the process was intended to generate 'buy-in' and excitement amongst stakeholders who are responsible for such environments. Prototyping also acted to bring transparency to the design process for those not trained in design.
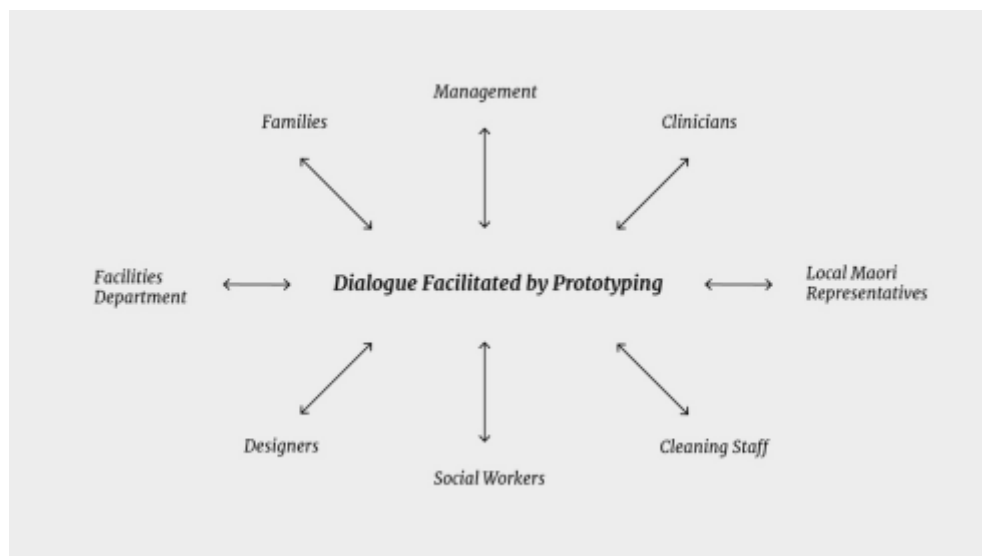
**Figure 1. Multiple stakeholders were brought together around design artefacts to contribute to a common goal.**

## Methods

An initial design sprint was facilitated to clarify the project's scope and explore its potential. This brought together designers and hospital staff to explore the assumptions of the group. The illustrated artefacts from the initial design sprint were exhibited to gather feedback and debate over the best way to refurbish the family waiting area. In some cases, the perspectives of staff conflicted with the perceived experiences of the families that used the space. Further inquiry into the experiences of all user types occurred through in-depth interviews with family members of acutely unwell patients and staff members (e.g. clinicians from the surrounding wards, cleaners, social workers, chaplains and Facilities team members). A product designer was present during these interviews to listen to what was being shared, sketching or noting down possible design opportunities. Throughout this process, a 'working wall' at our design lab was used to capture insightful quotes and progressively link up creative responses to an expressed (or latent) need and visually theme the types of feedback being shared, thereby communicating the process to stakeholders.

## Results

The commentaries received from participating family members were rich and probed beneath surface layer details such as wall colours, or comfy couches. Both staff and family members shared unexpected insights into how they perceived the family space. Their personal accounts of extended time periods in this environment encouraged empathy from people who hadn't considered how the space supports the emotional needs of families. For example, we heard about how the existing space was 'cold', clinical and impersonal, and failed to effectively accommodate families and friends seeking comfort, privacy and refuge. Due to the large, fixed nature of existing whānau rooms, the space was not suited to smaller families, whilst rooms occupied by one or two individuals prevented larger groups from feeling welcome. Additionally, the solid

visual barriers separated families both physically and emotionally from their loved ones being treated in the Intensive Care Unit.

These narratives were reframed into 'how might we' statements and functioned as tangible design goals that helped communicate to stakeholders the purpose of subsequent design solutions; for example, 'how might we provide the opportunity for private conversations within a more open space?' The design lab focused on how families could relate to others in similar traumatic circumstances, whilst also providing the opportunity for moments of privacy. Designers re-imagined the space through a range of hands-on methods including sketching, cardboard mock-ups, full-scale prototypes and digital 3D models (Figure 2). In particular, partitioning systems and furniture concepts were developed in response to the need for privacy, whilst configuring an overall interior layout that was open and approachable for both family and staff.

The embedded nature of the design lab, allowed the project to develop over an extended duration, through periods of activity and reflection. This allowed designers the time and space to produce outputs that may have never been considered or developed if the project lived outside the hospital. (Reay et al. 2016).



**Figure 2. Left: Scale models with movable components to explore dynamic configurations with stakeholders. Right: Full scale mock-ups of semi-private booth spaces.**

## Discussion

This project builds on the observation by (Bauer 1990) that different areas of expertise often have profoundly different methods, values, theoretical approaches, even conceptions of what counts as knowledge, and that the challenges that arise are often not from differences in expertise but differences in culture. In this project, stakeholders, families, employees and designers, despite sharing common goals for the waiting space, held different values, attitudes, beliefs and ways of thinking and doing (Bauer 1990). The 'voice' of families was a foundational component of this experience based co-design

project (Donetto et al 2015). However, as it was difficult for families to directly engage in the design process, the role of the design team was to give visual and material form to their conversations through prototyping.

The design lab is conducive to spontaneous making, with a main goal of creating believable physical objects/environments that can be experienced by end users and stakeholders (Figure 3). Taking people beyond the drawing board to experience what a design might be like in reality is an effective tool that has long existed within creative fields. What was novel in this context, was the introduction of such methods to Facilities team members, potential sponsors and hospital managers, whilst the concept was still developing and open to be shaped. Such artefacts are a powerful way to communicate shared visions and help to shape the future (Sanders 2013), particularly to those who may be distant from the emotional experience of families. It is through ongoing iteration and experimentation that coalitions gather strength and are able to overcome challenges (Murray, Caulier-Grice, and Mulgan 2010). By demonstrating an alternative way of working and changing dialogue amongst the project team, participants and management, commonly held views were challenged and people were brought together around a shared purpose. Through this, we sought to make visible the process and value designers bring through prototyping and sharing ideas.
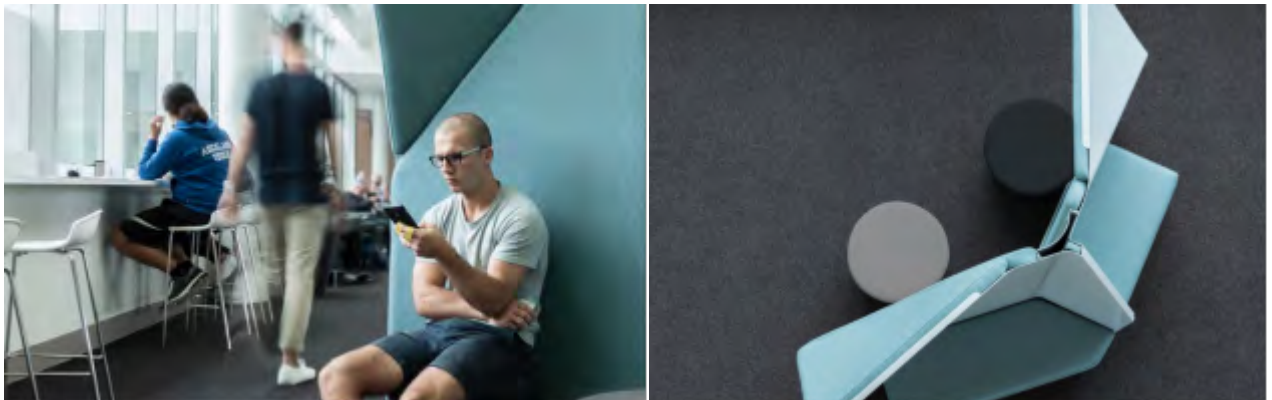


**Figure 3. An element of the reimagined space installed in the hospital for patients, families and staff to experience and provide feedback.**

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# Designers and hospitals: Considerations from an ongoing collaboration

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## Keywords

Co-design, small scale interventions, change management

## Introduction

Hospitals throughout the United Kingdom, Europe, the United States, and Australia are increasingly reaching out to employ internal design teams, hire external design firms, and work collaboratively with design researchers within universities (Reay et al., 2016). Over the last ten to fifteen years there has been increased recognition of the patient experience within clinical care, which has impacted design teams working to influence this field. There is a determined need to (re)design service delivery in hospitals towards this goal, in conjunction with patients and staff. Within this context, this paper introduces the Health Collab—a research lab in the Monash University Faculty of Art Design & Architecture—going on to detail the ongoing, multi-year, service and co-design collaborations that have been undertaken between the lab and Monash Health—the largest public health provider in Victoria, Australia. Worldwide, many similar health and design labs are emerging (Chamberlain and Craig 2017). This paper will discuss the work of our lab in relation to the growing body of literature provided by this emerging field. Through this discussion, we seek to propose five key considerations for working to develop collaborative processes, and design-led change, within established healthcare services; based on our experiences.

Monash Health hospital system is a large complex melting pot delivering over 100000 occasions of service, to a diverse population of patients, by 17,500 staff, in a network of 7 hospitals and 8 community and mental health care centres (A.Hadley, personal communication, June 2017). While this network reports to provide best clinical outcomes for patients, Monash Health strives to actively improve the patient (Bate et al., 2007; Chamberlain and Craig, 2017) and family/carer experience. In November 2015, Monash Health established a patient experience office (Donetto et al., 2005) specifically focused on understanding and improving the experience of patients within the hospital. Working in conjunction with Health Collab, Monash Health has entered into a long-term partnership to explore how this growing body of knowledge around design's value-add can be leveraged within this context.

## Method

The research team collaboratively developed a systems-level view of the organization and undertook a co-design approach to the project—working with frontline staff, clinicians and patients for in-depth observational research, interviews and a series of co-

design workshops to define issues and future solutions amongst these stakeholders. A context specific approach encompassed commonly practiced co-design methodologies with a few noted differences (Bate and Glenn, 2007). Through this work we have developed the following considerations when approaching collaborative design within healthcare services, including; the importance of recognizing and leveraging existing hierarchies within the system; focusing on long term engagement rather than quick results; recognizing when to privilege expertise; measuring success through process rather than outcome; and appreciating how small changes accumulate into large impact.

# Findings

The design team first ran workshops and introduced design thinking methodologies and skills to the organization's Senior Leadership team to leverage high-level buy in. This inversing of traditional co-design practices, by initially privileging the 'top of the hierarchy' led to increased support for project implementation at later stages in the process. When looking to create collaborative-led change, in our experience it has been valuable to recognize inherent hierarchies within the existing system. Approach key decision makers early and cultivate excitement and buy-in for the process before there is even a proposition on the table.

The second consideration we suggest is that introducing collaborative processes should be approached with a marathon mindset, not a sprint. This is important both from the perspective of the design team, and the hospital team. Give the design team time to learn, acclimate and understand the setting, and the healthcare providers time to experience and understand the role of the designers in the space. The advantage of the long-term collaboration with Monash Health allows the Health Collab to introduce collaborative practices one step at a time. First experimenting with working groups in traditional meetings, moving to design-led workshops, then including stakeholders in design-led research exercises towards implementation.

As reported by Donetto et al (2015)—in their review of Experience-based Co-design (EBCD) in the healthcare sector—co-design strategies can break down when it comes to the implementation phase of a planned design intervention. Entrenched hierarchies of hospital staff and expert mindsets of designers end up being the ultimate decision makers and driving force behind implementation. We maintain the stakeholders' expertise -- including the designers' at key points in the process, trusting these stakeholders to drive the initial collaborative process forward. Our research has found that the collaborative design approach to research and ideation provided a foundation for collective buy-in and effective change management, throughout the implementation process. The people involved in the earlier stages of the process recognized and valued their contribution, even when they are not as involved in the implementation step. The traditional design process encourages a vacillation of convergent and divergent phases. Here we see the convergence of the collaborative mindset being enhanced through convergent pushes that privilege the implementation expertise of the stakeholders.

When working within hospitals, or other complex organizational contexts, the need for systemic change is an oft-quoted expectation. Reflecting on this expectation and the design field's work over the last decade in healthcare settings, there is notable

frustration in the inability to create large-scale changes and measurable progress (Kanter, 2011). Good service or experience design is not always immediately apparent, and does not serve a *critical* clinical function, so it's often difficult to quantify design's contribution to healthcare (Jones, 2013; Donetto et al, 2015). When trying to measure change within a 'wicked' system, it is not practical to try and isolate the effect of single process, tactic or intervention to be able to measure it's effectiveness. Rather, value must be "measured" through process, not individual outcomes. Through *how people engage with and experience changes*.

Lastly our paper considers how the success accumulates through small-scale interventions that lead, over time, to large-scale change. This view of success allows the work to build a history of small wins while laying the groundwork for longer term, systemic change to take place. Our fourth and fifth considerations work together. The goal of a service co-design approach to systemic change is to collaboratively navigate the 'web' of complex organisations to build process-oriented changes for the long-term that can be used across the stakeholder team, not "success" within a single project.

The considerations presented in this paper privilege long-term relationship building and a focus on embedding effective processes throughout the system. It calls for stakeholders to maintain constant conversations between the small wins (and failures) and envisioning the larger scale goals. It is hoped that the ongoing nature of this collaboration will continue to mature these insights into the future, in conjunction with contributing to the growing body of literature in this space.

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# Strategic design innovating wellness for the 21st Century workforce

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## Keywords

 Strategic Design, Millennial Wellness, Wellcare

## Introduction

By 2015, 53.5% of U.S. workforce participants were Millennials; a majority that will grow over the next three-to-four decades as this generation continues to determine and shape economic development. We discuss Millennial workers' prioritization of purposeful work, values-driven corporate citizenship and work-life balance, arguing that strategic design will play an important role in reimagining workplace wellness strategies to reflect these values. We present and reflect upon insights derived from interviews with six New York City-based Millennial-generation design strategists who are using design methods and tools to help businesses to reimagine 'human capital' and work environment. Each of these strategists is working on a different facet of holistically-understood wellness and 'wellcare' and the problem of how to introduce it to the workforces and work environments of our knowledge economy.

## Part 1. New norms, demands and workplace wellness

The military acronym VUCA (Volatile, Uncertain, Complex, Ambiguous) was embraced by businesses following 2008-09's economic recession as organizations sought to explain volatility in conditions that had prevailed under more stable conditions (Bennett and Lemoine 2014). A 'new normal' is now understood in corporate environments affected by digitization, connectivity, trade liberalization, global competition, and business model innovation" (Lawrence 2013).

The most visible manifestation of new workplace norms, the 'gig economy.' disaggregates traditional careers into as-needed tasks, often fulfilled via online platform services which nudge workers from single-role careers toward fluid and collaborative ways of working. Digital workflow tools and collaboration platforms facilitate remote, asynchronous, sometimes piecemeal engagement on projects. Finally, today's employees are more likely to embody "hyphenated" job descriptions; fulfilling two or more discreet work roles (Schwartz, Liakopoulos, and Barry 2013). These three factors enable many businesses to scale up and generate value with far fewer workers; a situation illustrated when Instagram (with its thirteen employees) was bought by Facebook in 2012 for one billion dollars (Rusli 2012). Although these trends may suggest a loosening of employer–to-employee commitment, the reverse can be true for those workers who can generate [high] value in today's knowledge economy.

As both employers and employees seek to benefit from changing work habits, attention is being paid to psychological workplace wellness. Hierarchical power structures are being replaced by flatter hierarchies which promise to give more agency and autonomy to their workers (Kastelle 2013), consequently, attention to both physical and mental workplace wellness is understood to deliver financial advantages: a belief driven by the upward vector of U.S. healthcare costs driven by chronic and 'lifestyle diseases,' e.g., obesity, heart disease, diabetes, mental health issues (Figgis 2017) associated with sedentary-yet-stressful workplaces. In the U.S., employers are responsible for the majority of their employees' health insurance costs, while small business and gig employees partake in exchanges currently granted through the Affordable Care Act. In both cases, co-pays are costly, deductibles high and drug costs increasing (Barnes, Isgur, and Judy 2017); all factors that should create broad receptivity toward wellness innovation.

## Millennial identity and definitions of wellness

Lack of millennial employee longevity and loyalty is perceived as a key HR problem (Walker 2017). Some companies have responded to a competitive market (for top talent) by blurring the boundaries between work and leisure which retains key employees yet sometimes allows toxic workplace cultures to flourish (Flynn, 2017). The gig economy's upside, its flexibility, has opened conversations around non-monetary compensation (e.g., about when, where and how work is accomplished and whether the employer attends to employee satisfaction and quality of life). The recession and heightened concerns about the earth's environment have conspired to focus attention on the value of meaningful, socially and environmentally important, work. As businesses adjust supply chains, management styles and branding strategies in response to new economic realities, so innovation must be directed toward employee wellness-as-competitive advantage. Post WW2 generations defined identity through countercultural rebellion, in contrast Millennials tend to respond strongly to social affirmation. Wellness activities (e.g., juicing, yoga) are viewed as high-status consumables; a movement from healthcare to 'wellcare' has seen the rise of brands such as Lululemon, Soul Cycle at al. and is supported by "likes" on social media and by reinforcing feedback loops via apps and devices (Vocke et al. 2017).

## Part 2. Strategic design to reimagine and innovate wellness

Many strategic designers are currently working to address how wellness might be imagined, articulated, implemented and integrated in organizations. We interview six Millennial-generation design strategists (all of whom are recent alumni or associates of Parsons' ELab (Entrepreneur's Lab)) (Parsons 2017) about how they use the tools and methods of strategic design to address wellness for Millennial employees. We interview:

1. Samar Ladhib, a strategist in a large-scale healthcare branding agency, discusses the most effective points of leverage for design in creating opportunities for integration of wellness concepts and platforms;

2. Limassol Zok, founder and CEO of Offseat, whose product facilitates widespread utilization of walking meetings, addressing sedentary employees and health costs associated with sitting;

3. Nick Morozowich, co-founder and CEO of Empathecary, whose system helps consumers understand quality, dosage and effects of therapeutic and medical cannabis, addressing gaps in an industry which currently lacks consumer guidance and clinical oversight;

4. Ashley Amin, co-founder and CEO of Civic Fleet, whose service eases the burden of caring for elderly and ill family members, addressing work/life challenges of the 'sandwich generation' of employees.

5. Gabor Tankovics, founder and CEO of Dartboard, whose B2B product reduces employee student loan debt (utilizing timed payment reminders via text message) addressing the stress that American Millennial employees face in managing their student debt obligations.

6. Sarah Jones, founder and Executive Director of the Parkinson and Movement Disorder (PMD) Alliance, whose services integrate the various needs of the entire community around individuals afflicted with movement disorders, designing a holistic approach to the caregiving demands of the 'sandwich generation.'

# Conclusion

Part 1 contextualizes wellness amidst a generational shift in the American workforce, describing the spaces for innovation. Part 2 uses a structured interview format to highlight specific examples strategic designer's utilization of various tools and methods to both innovate in the wellness space and address obstacles to wellness adoption in complex U.S. healthcare and employee benefits environments.

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# Using co-design workshops to develop a ward-level patient experience improvement toolkit.

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## Keywords

Co-design, patient feedback, data collection.

## Introduction

A positive patient experience is widely considered to be a key indicator of high-quality healthcare delivery, and the collection of feedback about a patient's experience of care is now routine in our health services (Berwick, 2013; Francis, 2013; Keogh, 2013). Over the last few years we have seen significant increases in the collection, analysis and response to data about the public's experience of healthcare. A number of different processes have been developed to facilitate both the collection of this information, and to enable healthcare service users, families and friends to share their opinions and experiences. Previous research on the use of patient feedback to improve safety, however, suggests that without support to interpret and use this feedback, data may not be used effectively (Sheard, et al., 2017).

In this paper, we report on a cross-disciplinary research project, that was designed to help understand and enhance how hospital staff learn from and act on patient experience (PE) data. This paper outlines the process and thinking behind the use of co-design workshops to engage a range of stakeholder representatives in the design and development of a Patient Experience Improvement Toolkit (PEIT) that could be used to review, make sense of, and apply patient feedback data on hospitals wards to assist with service improvement strategies. The co-design workshops were part of a research project funded by the National Institute for Health Research's Health Services and Delivery Research Programme in the UK, entitled "Understanding and Enhancing How Hospital Staff Learn from and Act on Patient Experience Data". This 32-month project brings together a team of qualitative researchers, health and occupational psychologists, designers, service representatives, and patient advocates from Bradford Teaching Hospitals, NHS Foundation Trust, Institute for Health Research and Sheffield Hallam University.

# Workshop Method

The PEIT was developed through three workshops using participative co-design methods as a way of engaging a variety of stakeholders (Archer, 1995; Bowen, 2009). Representatives from six wards from three NHS Trusts and a group of six patient/public representatives volunteered to take part in the three workshops. Findings from qualitative research around the experience of using patient feedback undertaken with the six wards prior to the workshop activities helped inform the content and focus of the workshops by identifying existing stakeholder concerns and requirements.

In workshop one 'Lego Serious Play' methodology was used to stimulate further dialogue about the existing participant's experience and expectations of patient feedback through the medium of 3-D model-making (Langley, 2016). Using information collected in workshop one, workshop two examined how three identified common areas of interest: the different types of data available; the range of people who use and create PE data; and the environments in which this data is used, were explored to devise ideas for more effectively using the patient feedback resources to hand. Workshop three asked people to work through a prototype version of the PEIT, providing feedback to develop a second version that could be tested in wards. Between the workshops findings were analysed by the research team, including designers and improvement science specialists to inform the next workshop. The second PEIT prototype is currently being implemented as part of an action research study conducted over 12 months in the six partner wards. Action research cycles will capture how implementation of the PEIT works in practice and what changes are needed to stimulate acting on patient experience in different ward environments (Coughlan & Brannick, 2009).

# Outcomes and preliminary results

The three participatory workshops allowed for in turn: a better understanding of the current experience of patient feedback from a variety of stakeholder representatives; the identification of three important factors that play a significant role in the understanding and uptake of patient feedback data, (1. different types and forms of data, 2. people, their roles and responsibilities and 3. environmental factors). Moreover, the design of the activities undertaken in the workshops allowed for the development of a participatory process that helped healthcare workers to describe and record a patient feedback data experience that was particular to their own situation and requirements.

Other key considerations which were identified through the workshop activities and qualitative research were that:

- Teams needed to be formed to take ownership of the data to deliver change

- Patients need to be involved in patient experience initiatives

- A set of guiding principles for using patient experience data should be used to

  underpin these initiatives

- Positive, negative, formal and informal feedback is valuable

- Ways of developing plans for celebration/communication of improvement are needed

- Developing relationships with other professional groups to support ward-level work was seen as good practice

Resultant in the three workshop activities a printed toolkit prototype was designed that consisted of a series of team-based activity sheets that could be completed in stages by a patient experience team on a ward. These activities were supported by background information on the project, instructions on how to go about completing the exercise, and a variety of contextual information and exemplar resources, which were included to help teams develop their own responses to patient feedback data. The ward teams are supported by an action researcher and an improvement specialist. The toolkit prototype was designed in the form of an A4 ring binder with detachable pages that could be taken out to facilitate group working. This also allowed for the printing and compiling of small number of copies that could be used in the workshop and tested on the ward, allowing for suggestions and alterations to be added to the toolkit in a series of iterations (Fig 1.).

Through the development of the PEIT in the workshops it was further revealed that there are differences in the volume, quality and types of feedback available to wards, and in the ward-level systems used for the capture, interpretation and use of feedback. Common issues across the different wards and for a range of ward staff included difficulties in extracting trends or themes from feedback on which to base plans and actions. This also contributed to difficulties in celebrating what was identified to be working well or could be used to improve care experiences.



Figure 1. Details of the Patient Experience Improvement Toolkit (PEIT) prototype.

## Implications

Toolkits are an increasingly common way of introducing practice change within healthcare. This case-study explores challenges encountered in developing a general approach to an area where there are significant contextual differences and looks at how

taking a pragmatic ground-up approach assists with addressing this. The co-development of a toolkit with end-user stakeholders has allowed for a nuanced understanding of the variety of environments and working conditions in which patient experience data is to be considered, responded to and recognised. Feedback to-date suggests that the PEIT toolkit helps provide a framework for different teams to consider and act upon the specific needs and requirements for patient feedback data of their own ward.

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# Integrating responsive design and interdisciplinarity for healthcare environments

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## Keywords

Interactive, immersive, sensors, product, technologies, human-centered design

## Introduction

Entering a hospital environment can be a disconcerting and disorientating experience for both patients and visitors. These feelings are heightened for users facing particular challenges, for example outpatients experiencing early signs of dementia or those with language, reading or vision difficulties. Navigating hospital corridors followed by long periods of time spent in anonymous waiting areas can increase stress, negatively impacting the health and wellbeing of the very people the visit is intended to help. For regular outpatients, the experience should become easier with familiarity, however, impersonal environments could mean that repeated visits actually demoralize rather than empower the regular visitor. This has led to a concern over the "spatial and physical conditions of hospital settings on patients' subjective well-being," (Andrade et al. 2016, 301). The design-led research this abstract is drawn from addresses this issue and in particular considers whether designing the experience across scales (integrated across wearables, to objects and larger environmental interventions) can support a heightened "sense of control and empowerment" (Ido, Heylighen, and Pintelon 2016, 244). The project explores this integrated design approach across traditional discipline boundaries to enhance connectivity and potentially improve the experience for the outpatient.

## From the body to the building

In response to technological developments, such as the Internet of Things (IoT) and artificial intelligence, a range of individual digital technology-based solutions for personal healthcare have entered the market that have been adapted for specific users such as aged care applications, from wearable personal fitness devices to robotic personal companions. However, these technologies increasingly raise questions about the growth of digital relationships over human ones for this sector. Personal history, connection to place and cultural connections are rarely fundamental to these technological responses, with the impact of the way in which people express identity and interact with each other rarely evident as a driver for the designs. This research looks at approaches to building responsive environments across scales, from personal devices to retrofitted structures. Whilst it explores different forms of responsive technology to create designed healthcare environments that are integrated across scale, from the body outwards, its intent is to provide opportunities for the design of more

cohesive and sensitive patient experiences (within and external to the healthcare environment). Aligned to emerging strategies for supporting patient health and well-being, such as salutogenesis (health promotion) and biophilic design, the idea of these integrated environments is that they are personalized. They support the user moving through the healthcare environment, and are responsive to the individual patient needs, rather than the patient having to negotiate the environment independently and anonymously. The aim is to engage individuals with coordinated, human-centred responses that provide both practical wayfinding advice and reassuring human connection. This integrated experience could be initiated even before the patient enters the healthcare environment to prepare the particularly vulnerable patients more effectively for the experience. This would facilitate patient agency at a time when society enters the "Third Era of Health," with longer lifespans and an increasing focus on patient wellbeing (Mazuch 2016, 43). To also consider the impact the extension of the treatment environment via technology to home and public spaces has on the patient and how this impacts on designers considering a more patient-centric approach.

## Integrating design education

Portugali and Stolk highlight the interconnectivity of modern living from the "scale of a cup on a table, within a room, in a house, city, unexplored space" (2016, 223). They argue that the object or artefact is part of a larger system or strategy; to respond to the "action-patterns" of human existence whilst in design education, "no one discipline teaches a design framework that covers the continuum of all the scales in our immediate live environment" (Kuniavsky 2010, 158). Whilst the discipline edges may be blurred in emerging areas such as wearable technologies, traditionally Interior Design focuses on the body-scale experience, Industrial/Product Design on specific parts of the human body (such as the hands and head) and Interface /Interaction design traditionally at the scale of screen monitors (2010, 158). The design-led research this paper is based on explores the interdisciplinarity needed to created fully integrated, immersive environments, and provides examples of working across scale and discipline. Connections are created at the scale of the body/jewellery, through to objects and public space-interior structures, with the work considering how design processes can be applied across scale with a particular reference to sensory and space perception and how this can facilitate well-being.

## Embedded meaning in connected environments

Fundamentally, the work explores embedding meaning or story into objects and environments through digital technologies to promote place and culture connections across four key provocations and scales – Intimate, Private, Social and Public (examples of modelling from development work shown in figure 1). These works are part of investigations into how designers can respond to this holistic shift to consider integrated design solutions encompassing all scales and the resulting implications to design practice and thinking.

Figure 1. Exploring connecting across scale (intimate, personal, social and public scale)

The ideas and approaches explored inform design-led research in a hospital context. A key outcome is how this integrated approach has the potential for therapeutic benefits and the ability to navigate unexplored space and services with increased confidence and familiarity, and the resultant impacts on user or patient well-being.

## Conclusion

In a digital era, it is tempting to focus design on the capabilities of the technology to deliver increasingly autonomous solutions. Yet there is a potential for digital technologies to create a disconnect with the individual. Design research needs to re-emphasise the human-centred aspects of design, and address the complex challenges of providing holistic solutions to problems relating to the human experience. For healthcare, integrated design that crosses discipline boundaries, from personal scale to architectural, has the potential to create environments that support the individual, rather than alienate them. A purely technological approach will fall short, but one that is human-centred to create a personalised, meaningful experience could genuinely support the patient and reduce the stress that a large hospital environment can create.

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# Interdisciplinary and cross-cultural approaches to design for healthy ageing

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## Keywords

interdisciplinary, cross-cultural, design, healthy ageing

## Introduction

Different disciplinary and cultural perspectives can be a means to create new ideas and approaches that provide a deeper understanding of the needs of the global ageing population.  The populations of Australia and many other countries in the Asia Pacific region are ageing. In Australia, the number of people over 65 years will rise to 9.6 million by 2064 (Australian Institute of Health and Welfare 2017). In Singapore, it is estimated that the 440,000 people currently over the age of 65 will double to 900,000 by 2030 (Ministry of Health 2016). In China, 123 million people, or 9 percent of the population, are over 65 with estimates that China will have the largest aged population in the world by 2030 (Center for Strategic and International Studies). The impact of the ageing populations in Australia, China and Singapore will be profound. This will challenge designers, planners and health care professionals to develop solutions to better meet the needs and harness the capacity of our growing and diversifying populations of older citizens, including in relation to housing, community interaction and co-operation, health and well-being, and the integration new technologies. To address these challenges, we created a series of workshops with Australian students in China and Singapore to examine design for healthy ageing from cross-cultural and inter-disciplinary perspectives. This paper describes the results of the workshops and explores the benefits of this approach through the lenses of clinicians, industrial designers and graphic designers.

## Clinician perspectives on design for healthy ageing: Reflections from the China and Singapore workshops

Do clinicians have a role in developing the knowledge and practice of designing products, services and interventions that promote dignity and enhance quality of life? We assert an emphatic YES! As a response to the challenges and opportunities of the ageing population in Australia and beyond, the rapid advances in science, technology, medicine and health care more broadly, and increases in government regulation and patient expectations about health care and service delivery, design solutions are increasingly being sought to ensure high quality and effective health care (Carpman &

Grant 2016). Additionally, with the rises in non-communicable diseases, multiple chronic conditions, levels of disability and healthcare utilisation in segments of the increasingly older population (Beard, Officer & Cassels 2015), clinicians and other health providers must be considered active partners in service and product design to ensure the clinical efficacy and user acceptability are achieved. Coming from diverse and ageing societies, and being actively engaged in interdisciplinary work to provide safe, high quality care and services, the fresh, clinically oriented attitudes and ideas of nursing students have enhanced the outcomes of, and were enhanced by, participation in the Inspired by Singapore: Design for Healthy Ageing workshops to co-design products, services and other innovations with design practitioners from Australia and Asia.

## User Experience for Healthy Ageing: a Cross-Cultural Approach

Technology is becoming an ever-present part of our daily lives and as such, interpreting multiple graphic user interfaces has become an essential skill for navigating the environments in which we live, work and play. Most commonly, graphic user interfaces are developed with the younger generation in mind thus adding to the issue of adaption of new technologies amongst older people. Our Singapore and China workshops had a goal to bring cross-cultural groups of young designers and nursing students together and to connect them with care facilities, communities and design companies to reimagine interfaces and technologies that would respond to the needs of the population of older people in our respective countries. We will discuss how this process can lead to innovative and informed design solutions.

## Design Ideas for Healthy Aging: perspectives from Australia, Singapore and Hong Kong

With extended life expectancy and increasing older population around the world, market studies and companies have identified a "golden opportunity" around design and development of products and services for healthy and active aging. Within a user-centred design philosophy, "one size fits all" solutions are inadequate due to the diversity of people, needs and contexts. Lifestyles and customs can vary widely according to age, people and culture. This presentation summarizes findings of cross-cultural and multidisciplinary design workshops conducted with students from Australia, Singapore and Hong Kong, to propose novel products and services for healthy aging.

## Conclusion

Creativity is enhanced with diversity, as a multiplicity of points of view can produce a larger number of new ideas, which can then be evaluated, filtered, developed and tested, in order to produce novel design for health solutions. We have used a user-centred co-design approach based on empathy, which promotes immersion in the problem (do), as well as observation from an external point of view (see), visits and interviews with diverse stakeholders (ask). We also propose a cross-cultural empathy framework, which includes understanding of what peoples from other cultures do, think, feel and believe. Multiplicity of disciplines in design and health areas has provided

diverse points of view to solve the identified problems. Understanding aging issues across different countries (Singapore, Australia) and cultures (Malay, Chinese, Indian, Western) has allowed us to compare and contrast differences and similarities, thus providing a more holistic perspective on the problems.

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# The impact of user experience on simulation or VR-based training software in the field of medical surgery and teaching environment.

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## Keywords

user experience, digital teaching, VR, medicine, design thinking

## Introduction

Simulation in medical training plays more and more an important role for the learning success.

"VR simulation is undeniably a safer and more effective way for surgical trainees to become familiar with the techniques and equipment required in a surgical procedure before performing them on a real patient. (Wei, 2012) Simulator trainings in colonoscopy for example "does lead to improved patient-based colonoscopy performance in the early stages of training" (McIntosh, 2014)

## Problem

"While VR and robotic assisted surgery may seem completely different, they share a core challenge—the need to maintain a connection between the real and the virtual worlds….The reason for that challenge is a built-in tension: the more deeply you are immersed in one context (whether the virtual context in VR, or a surgical view inside a patient's body) and the more natural the interactions, the harder it is to maintain the connection to the broader physical world." (van Engelen, 2017) "The gap between who designers and developers imagine their users are, and who those users really are can be the biggest problem with product development." (Goodman, 2012)

## Research question

How can Design Thinking find approaches to optimize a simulation- or VR-software for medical teaching, especially Virtual Reality Trainers with high fidelity haptics, with the goal to get the feel of use between simulation and reality closer together? My aim is to determine whether adding user experience as a key factor to the software development process improves the face and construct validity in surgery performance for experts and for trainees, especially in sense of acquiring practical competences (VR-based learning). Which are important factors to be added in research, to make the user experience better in the end after refining the product on base of the research results. What would help to close the gap between simulation and real surgery, make the simulation experience real?

# Theoretical framing: Teaching and learning methodology

The principle of problem-oriented teaching and learning is based on the experience that fertile learning begins only when the student becomes a "problem" (Norman, 1992)

# Multimedia learning—research approaches

Within the research about using online games for learning, "learners characteristics and cognitive learning outcomes have been identified as the key factors in research on the implementation of games in educational settings" (Yang, 2013). "Feedback that is automatically generated immediately after a practical simulator session should enhance trainees' knowledge and ability to reflect critically on their performance and improve their skills" (Cline, 2008). " The big challenge is to determine how accurate, realistic and trusted the feedback is and, thus, should also be validated appropriately" (Alsalamah, 2017).

# Methods

Methodically, we follow the design-thinking approach of IDEO, which is known as a pioneer of human-centered design—putting people at the center of work" (IDEO, 2017). IDEO is one of the most innovative and award-winning design firms in the world (IDEO, 2017), they have designed hundreds of products, like the first computer mouse for Apple (…), the Palm Pilot (…) IDEO's main tenet is empathy for the end-user of their products. They believe that the key to figuring out what humans really want lies in doing two things: Observing user behavior—Try to understand people through observing them (…) Putting yourself in the situation of the end-user—IDEO does this to understand what the user experience is really like" (IDEO Designkit, 2017).

A questionnaire with product-related statements will be distributed to a number of 10 participants with differing levels of surgery experience in order to determine the level of agreement between the use of the simulator in training and real practice. Additionally, the users will be observed, silent, while using the simulator as well as, if possible, in real-life surgery. As a third method, final expert interviews will complete the study.

# Who will benefit

There will benefits for different groups. First, the user of simulation software—especially the students/trainees—second, the producer of the software who will get important usability insights directly from the user's feedback and out of the observation. This feedback is important for the further product development process and can be used within the iterative design process as well.

Third the medical community can participate as well from the research results and possible changes in the software products. In the end the patient, who will may have better surgery methods.

# Results

The study partners are still in definition: I have an expression of interest of the Medical University of Heidelberg as well as technology companies (simulation software producer). Additionally, the Frauenhofer Institut or RWTH Aachen may be an interesting research partner as well for usability tests.

# Discussion

There are many apps and software products in the medical sector or related fields which combine certain aspects of multimedia learning and positive user experience. To name some: miamed.de (Amboss), PrimalPictures (Anatomy.TV), Storyboard VR or the game surgeon simulator.

# Limitations

This study has to come out as a prestudy, because at the time, I placed the paper, the interviews have not been completely proceed.

# Conclusion

User experience has a big impact on learning outcome and on the joy of use. Digital learning, multimedia and VR/Augmented reality support the learning process and the learning results. Gamification in medical training and simulation software (e.g. used in "Surgeon simulator" for Oculus Rift) will become more and more important for the user engagement.

Through deep learning methodology (artificial intelligence) within the software, the accuracy of simulation and VR could be potentially refined (expert user feedback could be used as an additional variable to specify the simulation accuracy). Extending the feedback group even to the worldwide medical community, especially to optimize the products in sense of crowdsourcing product development, in a direction of artificial intelligence (bots in medical environment) or for knowledge transfer (sharing) could be a good chance as well.

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# Can you have your cake and eat it too? A dilemma-driven approach to design for the early stages of health behaviour change

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## Keywords

behaviour change, emotional dilemmas, healthy eating, contemplation.

## Introduction

Responding to rises in lifestyle related diseases over the last decades, we have seen a rapid increase of communication, products and systems designed to support people in adopting healthier lifestyles. Currently, the number of mHealth apps in the market is 172,000 with an average of 4 million downloads everyday ("Mobile health apps", 2017). Communication plays an important role in raising awareness about the necessity of change and mHealth apps and devices can motivate people to adopt and sustain change in health behaviours. However, most of these systems has not yet succeeded in guiding people towards sustained behaviour change (see also Ludden, 2017). Many products and services seem to focus on the middle stages (action, maintenance) within the Transtheoretical Model of Behaviour Change (TTM) (Prochaska & Velicer, 1997), where people have already decided that they need and want to change a specific behaviour (see Ludden & Hekkert, 2014 for a review). However, when it comes to healthy lifestyles, most people are in early stages of change (Kramish Campbell et al., 1999). Therefore, current products and services are often not able to reach the large group of people that has not yet decided that they need to change; the people in the (pre) contemplation stage within TTM.

A distinguishing characteristic of the 'contemplation' stage is that people in this phase gradually become more conscious of their unhealthy behaviour and start contemplating which health behaviour they want to change (and why). A 'process of change' that people reported to have used to progress through the contemplation stage is self-reevaluation (Prochaska et al, 1992) which involves cognitive reappraisal of how behaviour change is part of one's identity. This process has, for example, found to be important for women's decisions to eat more fruit (Chung et al, 2006).

Self-reevaluation relates to self-control processes as proposed by Counteractive Control Theory (CCT), where the latter involves sustaining the pursuit of long-term goals (or personal values that are, for example, coupled to identity) against the motivational pull of immediate desires (or temptations) (Fishbach and Converse, 2011). According to CCT, people can anticipate experiencing self-control dilemmas (e.g., lingering in bed instead

of waking up at a planned time to go running) and devise personal strategies to withstand temptations (e.g., pre-commitment: placing sports shoes next to the bed before going to sleep). Therefore, a way to further zoom in on this complex phase of contemplation and reevaluation is to analyse it through the lens of self-control dilemmas (Ozkaramanli, Ozcan, and Desmet, 2017). The framework of dilemmas, shown in Figure 1, can act as an analytical tool in disentangling the complexity of human behaviour in forced-choice situations. Consider the following scenario: You have decided to eat a less sugary diet. At work, your colleague has brought a home-baked cake to celebrate her birthday. Everyone is having a piece and you feel that, as a good colleague, you should join the celebrations - what if she gets offended if you do not have a piece of her cake? The framework of dilemmas captures the thoughts, emotions and behaviours involved in such dilemmas. Through this, it provides a reflective lens for analysing human behaviour and its underlying motivations (Ozkaramanli, Ozcan, and Desmet, 2017). Based on this analysis, designers can make better informed choices about how to intervene in behaviours. For instance, one way to intervene might be to suggest a kind way to explain the dilemma to your colleague or to suggest having a small bite to taste rather than a full piece of cake. Especially in earlier stages of change, it is important that an intervention (be it a mobile application or a separate device) does not force the user to make "black/white decisions", but rather facilitates some grey areas that can help people to progress through a process of change. As decisions to make a change are not yet fully internalized, such flexible approaches may prevent falling back. This grey area is included in Figure 1 as an important state between 'current behaviour' and 'new behaviour' that designers of health interventions should address.
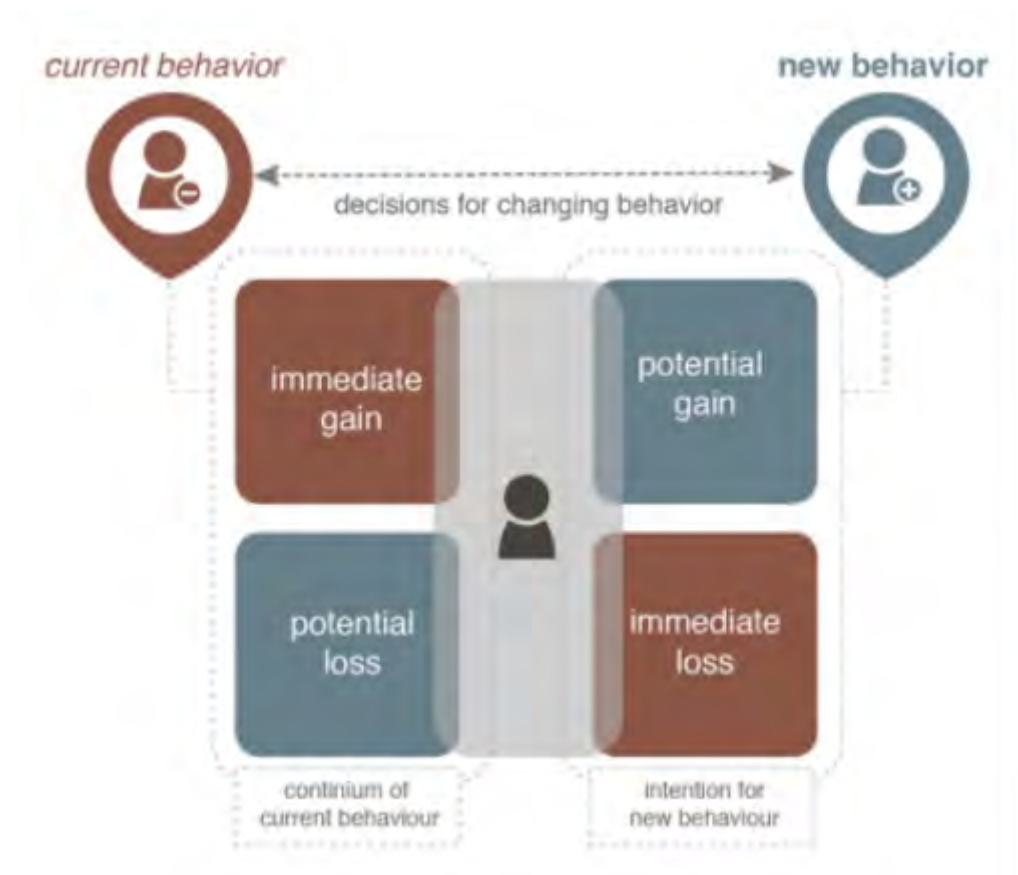
**Figure 1. Framework of dilemma's with 'grey area' in between current behaviour and 'new' behaviour.**

Although the framework of dilemmas helps unravelling the complexity of human behaviour, it only provides a 'snapshot in time' for a certain behaviour. As behaviour change is a long and complex process (Siegel and Beck, 2014), people might enter and re-enter a stage of change multiple times. Therefore, it is imperative that health behaviour change interventions are adaptive to dynamic user needs and contexts. In the above scenario, for instance, the intervention may at times motivate 'eating a non-sugar diet' and at times allow for 'feeling included in social events' without imposing guilt or shame on the product user. This adaptability also highlights that health behaviour change happens in a system of people, and thus, interventions that solely target individual users may not be as effective as those that consider the social aspects of health behaviour change (see e.g., Toscos et al, Arden-Close & McGrath).

Following the rationale outlined above, we suggest three focus areas that need further study to inform the design of adaptable health behaviour change interventions. We focus our efforts on the domain of healthy eating.

(1)     Guided flexibility: guided flexibility appears to be a key factor in long-term behaviour participation (Marcus, et al., 2000). For health interventions, this would entail the user to self-regulate the behaviour (Johnson, F., Pratt, M., & Wardle, J. (2012).

(2)     Accounting for emotional gains and losses:  When designing for behaviour change, an obvious approach may be to emphasize the emotional gains of changing behaviour (e.g., a feeling of pride). Yet, the losses of changing a particular behaviour

(e.g., anxiety or insecurity of moving out of one's comfort zone) should also be taken into account for health interventions to be reasonably realistic.

(3) Dynamics of interventions: dynamics has been found to be a key-concept for user-engagement (O'Brien, 2008). To design more engaging interventions we need to understand how an intervention can dynamically adapt to changes in behaviour and self-evaluation of someone who is actively progressing through a behaviour change process.

(4) To further study these focus areas, we have set out to define research efforts aimed at (1) further understanding strategies and processes that people use to change behaviour (2) designing and testing interventions that incorporate one or more of the focus areas. With these, we aim to define design guidelines that can support people to move through the "grey area" between current and new behaviour.

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# Wellbeing and the lived experience of dying with dementia in a typical Australian RACF

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## Keywords

dementia, lived-experiences, dying, RACF, wellbeing

## Significance

Driven by better health care and reduced mortality rates, Australians are living longer. While beneficial, the trend has also seen a significant increase in age-related diseases, particularly dementia. It was estimated that approximately 171,200 Australians had a diagnosis of dementia in 2000, increasing to 298 000 in 2012, further rising to 400, 833 in 2016 and projected to be between 730,000 and 942,624 by 2050 (Access Economics, 2011; Brown, 2017). With frequent co-morbidities, caring for people with dementia is beyond the resources of most families, and admission to an RACF is unavoidable becoming increasingly the place of death.

## Background

Given the above, it is not unreasonable for dementia and death to be considered core business for RACFs. Facilities however, do not perceive themselves as a place for dying and customary goals are to maximise independence and improve health outcomes (Puurveen 2008). Limited attention has been given how the design of the RACF built environment can support wellbeing and dying well.

While there is some consensus in environmental research of the benefit of small, homelike RACFs, the definitions are poorly understood, and research to date is largely empirical, focused on early to mid- stage dementia and managing behaviours and medical issues (Calkins, 2011). There are few qualitative studies and minimal environmental research on late-stage dementia, dying or from the perspective of people with dementia. Without in-depth understanding of the lived experience of people with dementia, their families, and staff, the reported dissatisfaction with the design of RACFs and community stigma will remain.

## Approach

Framed by a hermeneutic phenomenological philosophical approach, this study aims to develop a more comprehensive understanding of the lived experiences of people dying with dementia in a typical RACF, their family and staff. A secondary aim was to develop a sensitive research approach that is inclusive, collaborative, and gives voice to people with late stage dementia.

The complexity of issues and vulnerability of the participants anticipated a naturalistic, innovative, comprehensive, and multi-faceted approach evolving into a case study immersing the researcher within the lives of people living and working in a typical Australian RACF. Methods include months of voluntary work, observations, and engaging in informal 'impromptu conversations' and semi-structured 'prompted conversations' using environmental cues and individually customised prompts to assist the narrative flow. In keeping with notions of a reciprocal care relationship, the research approach equally valued the researcher and participants to collaboratively develop interpretations through a hermeneutic looping process including follow-up 'prompted conversations' and discussion groups.

Participants consisting of two RN/Care Managers, eleven staff participants including two RNs, an occupational therapist, a physiotherapist, a recreation officer, six care assistants, and nine family and nine residents with late-stage dementia. Participant numbers compare favourably with other case studies utilising narrative-based enquiry and observations (Djivre, et al. 2012; Hellberg, 2011) and the methods provided large amounts of rich descriptive material per participant (Kvale, 1996). Rather than write for generalisation, the intention was so to enable the reader to identify with and relate to the participants and their lived experiences, encouraging transferability to other long-term care settings (Denzin).

## Findings

In this study, current ideologies of homelike are challenged by participants' understandings of not feeling welcome, and the residents' lack of being at-home despite residential scaled furniture and domestic furnishings in public spaces. Findings suggest residents are deeply aware of their diminishing sense of connection to self, others, and the world but are unsupported by the RACF environment to connect. Familiarity and feeling welcome were identified as key for wellbeing, but there are few relatable spaces, minimal personal control, and few social attributes normatively associated with home. Residents have little ability to appropriate a space as their own and the bedrooms were not designed or encouraged by staff or the organisation for customisation.

The overall sense of the RACF spaces was that of beige neutrality and temporariness; an unspoken finitude of residence. Residents have not only lost their familiar home, they have lost all that home means to them, every-day and previously taken-for-granted practices of home and a sense of belonging to reside in a place experienced as artificial, homogenised and alienating.

## Conclusions

Despite ideals of ageing-in-place, assumed to be the family home, people with dementia are often removed from the community to die in institutions. In contemporary Australia, dying in at home has become denormalised; homes are for the living, hospitals follow a curist model, and hospices are for the dying, yet aged care seems yet to come to terms with their hybrid role for the actively living and the dying. Within the RACF, the actively dying were found to be further sequestered. Notwithstanding the oft-repeated ideal that residents should not die alone, ultimately many did, spending considerable time

leading up to their death in the loneliness of their rooms, or separated from others in the overly scaled living rooms. There was found to be little about the design of the built environment that supports the family to feel welcome, body removal, or a 'good death' and no mention of death in design briefs or standard design guidelines.

It was clearly demonstrated that people with late-stage dementia are more cognisant and impacted by the world-of-being-in-aged-care than widely assumed. They are able to communicate their awareness, and be involved in sensitively designed, valid research.

The study has implications for policy, funding, design guidelines and processes, and educating architects reinforcing the need for a multi-levelled collaborative consultation and design process for RACFs that acknowledges their true role as places to die. Further, the research design offers the potential to be adapted to include cognitively diminished people in both research and consultation in order to create more supportive environments.

When the overwhelming majority of participants said that an RACF should feel welcoming, it was not about the aesthetics of the building or furnishings. Rather about the elusive feeling of the environment enabling wellbeing by feeling at-home, a sense of belong and connection requiring a reconceptualising about the way we think about and design RACFs.

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# Design for dementia: Making spaces for uncertainty

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## Keywords

Advanced dementia, co-design approaches, playfulness.

## Introduction

This paper presents research undertaken as part of the LAUGH project to explore design processes and design of hand held playful objects for people living with advanced dementia. A series of six co-design workshops were carried out with experts in relation to dementia and design. This paper reports on a workshop with designers that enabled them to draw on their experience and training in design, provided creative opportunities to reflect on their personal values, and challenged preconceptions about designing for dementia care.

Dementia is a complex, highly emotive disease, requiring sensitivity, empathic understanding and compassion within a design context. Globally, the number of people with the disease is expected to double every 20 years. By 2050 it is projected there will be 115 million people with dementia worldwide (Prince et al. 2014). Dementia affects memory, perception, cognition and behaviour and as yet there is no cure for the disease. Current care practice involves physical day-to-day care but often neglects a holistic approach that considers a person's emotional and psychological wellbeing. Each person's experience of dementia is different and varies individually through the progression of the disease.

Designing appropriate, safe and beneficial products and services presents a challenge for designers with limited knowledge of dementia. Designers who have not had direct experience of the disease are often informed through medical and clinical viewpoints and are unaware of the embodied nature of the condition, the variations that exist from person to person, and the limitations and possibilities. Further challenges arise for designers exploring co-design approaches when engaging with people living with advanced stages of the disease, who are chair or bed-bound and may have severe communication difficulties.

Co-design events throughout the project brought together design professionals, family members, carers and health professionals who work directly with people in the advanced stages of the disease, to contribute their expert knowledge to the research (Treadaway et al. 2016a). Designers engage in co-design approaches where they become one of many expert voices as they work alongside and accommodate the ideas of other non-design specialists. As the process develops, the skills and technical

expertise of design specialists are also required to hone and refine co-produced concepts being developed and give them physical form and robustness. This critical phase in the design process was an essential part of the study discussed in this paper.

A Design Challenge event was held in which designers and technologists (who had not all been involved in the earlier workshops) were invited to contribute their expertise. A multidisciplinary group, with different approaches to the creative process and differing viewpoints on design, was brought together. The aim was to explore design for dementia and 'disrupt' or challenge existing design thinking. Qualitative data was gathered via audio and video recordings, photography and concept boards. A thematic analysis, informed by a literature review and interviews was used to interrogate the data and inform design development (Treadaway et al. 2016b).

The event was divided into three activity sessions using envisioning techniques to generate ideas. These included: association exercises, dot voting and storyboarding. Each session was followed by a group discussion with opportunity to reflect and focus ideas ready for the next activity. The intention was to move from the broad themes identified by the experts in previous co-design workshops and generate sketches or paper prototypes for playful products. The activities encouraged participants to think divergently and the structure of the event was designed to challenge each designer's established patterns of thinking, design processes, deeply held values and unconscious bias.

The design event had been set up with the intention of creating a secure 'space for uncertainty' for the design participants. However, the activity sessions were familiar to many of the designers and they were confident about moving forward with design concepts. Nevertheless, it was evident from the outset that, apart from the research team, understanding of the disease was limited, which had implications for product design and development. The 'place of uncertainty' that was being sought in the design process actually coalesced in the debrief session at the end of the workshop through discussion of language use and the appropriateness of terminology inherited from scientific, clinical, medical, technological, and design fields and applied to people living with dementia in a care environment (rather than a clinical one). It became evident that it could not be assumed that the use of ethically sensitive language would be viewed as positive and productive and that language use was an issue that needed to be dealt with as part of the learning, understanding and communication process. Discussion around language use provoked deep reflection on the ethical issues around design for dementia and highlighted how language shapes understanding and therefore influences outcomes (products, designs). This was crucial learning for designers new to the field, who had not previously considered the wider ethical implications of language used in a design context.

Several design concepts resulted from the activities including an idea based on a vintage telephone (see Fig.1). This concept provided a platform for broad discussion about services, technology and social media, and helped participants understand embodied issues related to dementia care. The telephone concept was developed further and informed by preferences and life history of a person in the advanced stages of the disease.
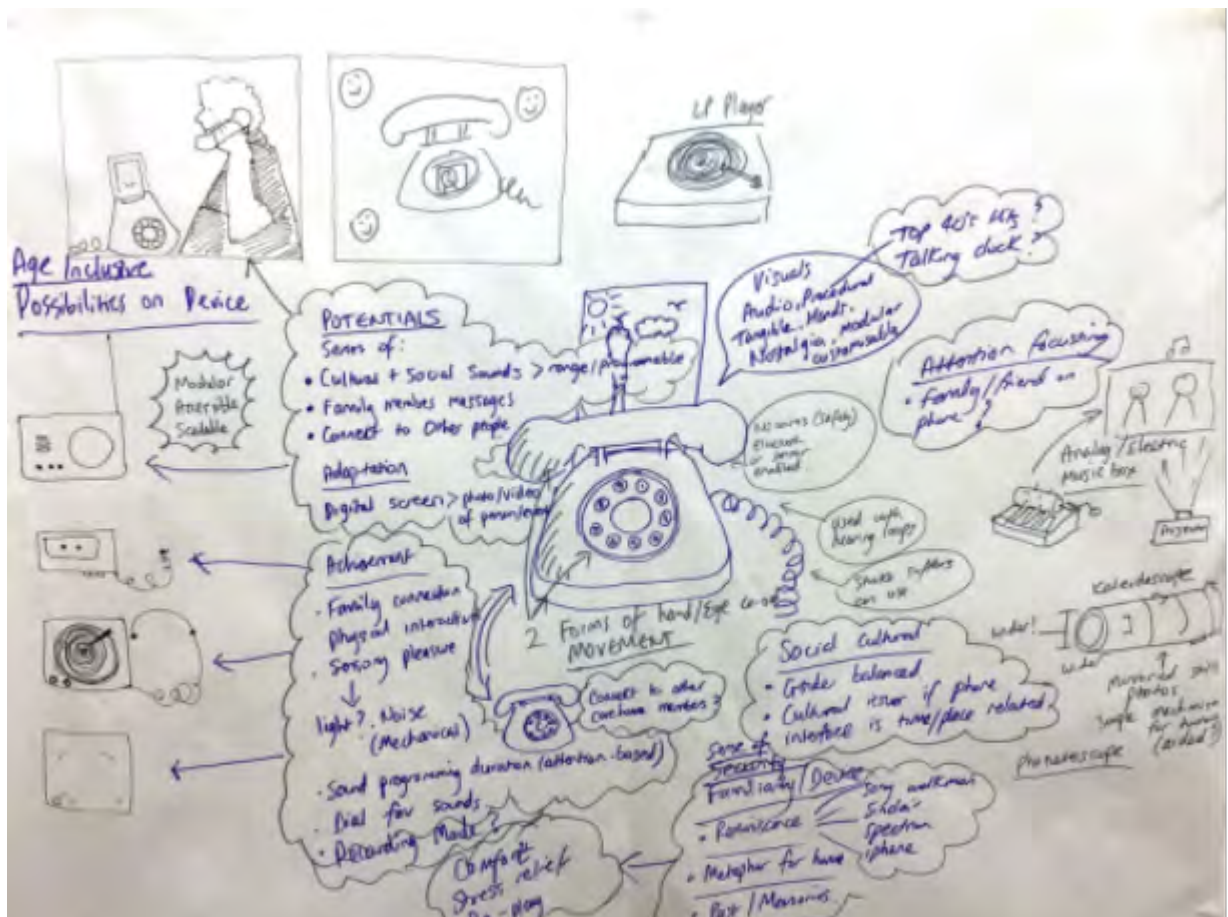
**Figure 1. Vintage telephone concept**

Analysis of the data yielded by the Design Challenge reveals ways in which designers working in the area of advanced dementia benefit from opportunities to disrupt their thinking and reflect on their personal values and unconscious bias in the early stages of design concept generation. Making space to explore their uncertainties in a safe environment with others who have deep subject knowledge facilitates shared language and deeper understanding to inform the development of appropriate design concepts.

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# Craft as purpose: Co-design for people living with advanced dementia

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## Keywords

Design for Dementia, technology, craft, inclusive design, wellbeing

## Introduction

The number of people living with dementia is predicted to increase as the global population ages (Prince et al. 2015). Medical and scientific communities continue to search for a cure for dementia and for treatments to alleviate symptoms of the disease, meanwhile, everyday strategies are needed to support people living with dementia and stakeholders in their care. While the disease is terminal, people living with dementia can experience a good quality of life, particularly if they are able to remain socially active and are engaged in meaningful activities (Orsulic-Jeras, Judge, and Camp 2000).

Dementia is a degenerative condition that impacts cognitive and physical functioning, judgement, and memory. However, people living with dementia are able to experience pleasure and joy. Furthermore, explicit and procedural memory, the type used in repetitive craft activities, is retained and people living with dementia are often able to knit, crochet and weave into advanced stages of the disease (Cohen-Mansfield, Dakheel-Ali, and Marx 2009). But, for those who are no longer able to engage in craft activities, or have no interest in craft, there remains a lack of age appropriate objects and activities to occupy, entertain, and bring pleasure to the lives of people living with dementia. So, people living with dementia, who have had active and busy lives, are often left for long periods of time without anything meaningful to do as they transition into greater dependency or institutional care, and are reliant on other people providing activities for them (Treadaway and Kenning 2015).

This paper will discuss an exploration of how craft activities and tools can be used to provide meaningful engagement for people living with dementia and present opportunities for social engagement and interaction. The investigation was undertaken as part of the Arts and Humanities Research Council (AHRC) funded LAUGH (Ludic Artefacts Using Gesture and Haptics) design research project in the UK. The project used a co-design approach to engage with a range of people with expertise in dementia care and the embodied experience of living with dementia—or in close proximity to the condition as a family member or carer. The findings have importance for designers with a focus on designing for people living with dementia and for stakeholders in their care, and in terms of offering non-pharmacological alternatives to enhancing quality of life and subjective wellbeing.

## Methodology

A series of six participatory workshops were carried out with stakeholders in dementia care. Each workshop focussed on a key theme and participants in each workshop were considered experts in a particular aspect of dementia, they included occupational therapists; cares staff; directors of nursing; psychologists; physiotherapists; representatives from government departments and advocate organisations; designers and design researchers; and technologists. The focus of the third workshop in the series, and discussed in this paper, is in relation to hand-use. The workshop explored how we can access implicit, explicit and procedural memories related to intrinsically motivated activities (including hobbies and craft activities) undertaken in earlier times. A range of video, audio, photographic, textual and visual data was collected throughout the workshops, and data also included the question cards and flipchart diagrams created in small groups during the workshop. Participants were asked to be self-reflexive about their engagement with materials and concepts in the workshop, to explore in-depth personal knowledge, and to be creative. They were then asked to focus on key themes and reflect on their own experiences and analyse contextualise this in view of their experiences of working with people with dementia.

## Findings

An important finding from the workshop about hand-use was how people living with dementia often needed a sense of purpose in their activities and this reiterates findings in projects undertaken in Australia (Kenning 2016, Kenning 2017). To satisfy this need for purpose people living with dementia in residential care are often provided with activities that were once purposeful for them, such as folding napkins or clothing. However, in this environment it becomes just 'something to do'. Similarly whereas craft activities may been a challenge, a means of occupying oneself, an achievement, promoted self-esteem and gave individuals a sense of identity, they are now often activities that are imposed in group sessions and risk being stripped of purpose for individuals. The workshop participants suggested that in their experience when craft activities, such as knitting, crochet or collage, were intrinsically motivated by people with dementia they were more beneficial to general wellbeing and that "…craft activities [should be] slightly more challenging and repetitive, [which] might make it more engaging. Have to pay attention and work on it.  Still familiar but more engaging".

## Conclusion

The project discussed in this paper is located in Wales, UK and as such may be culturally situated in terms of the types of craft activities undertaken and the types of responses to those activities. There are however transferences and learnings that can be applied to other contexts. The challenge then for designers is not only how to design using craft processes, activities, and tools, opportunities for engagement and interaction that can build on existing knowledge and retained procedural memory, but also can reinstate purpose.

The findings from this study builds on existing research in relation to how craft can provide purpose, meaning and continuity for people living with dementia and

stakeholders in their care. It does this through an hands on and embodied approach to craft in a workshop environment with a range of experts building on personal knowledge and understanding of the activity and people living with dementia.

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# Reciprocal design: inclusive design approaches for people with late stage dementia

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## Key words

design for dementia, reciprocal design, inclusive design, fun, bridging

## Introduction

This paper reports on the development of an inclusive design approach for people living with advanced dementia and stakeholders in their care. The pilot research project sought to ensure people living with dementia could have input to the design process, regardless of their abilities and level of contribution, and enabled designers to gain a holistic understanding of living with dementia. In addition, the project used a 'reciprocal design' (mutually advantageous) approach to ensure that participants experienced 'in the moment' pleasure from the design process (and not only the outcomes) while designers benefitted from the input of the participants.

With the increase in the median age of the population, the number of people living with dementia is predicted to increase. Currently there is no cure and health and welfare resources are limited. Alternative approaches are needed and attention is being shifted to how to live well with dementia and to attain the best quality of life possible (Alzheimer's Society 2016, National Health Scotland 2016). Design has an important role to play, and design projects are focusing on how to provide support and enhance the lives of people living with dementia and stakeholders in their care, but more designers are needed to work in this area (Kenning 2017, Kenning and Treadaway in press, Treadaway and Kenning 2015). To support personhood, designs need to be personalized and inclusive approaches are needed to engage the user in the design process. But because of the numbers of people that need support, design needs to move beyond one-on-one design and engagement approaches to personalization. So, this project explored how inclusive design projects can be scalable to involve larger numbers of designers, and enable people living with dementia to benefit directly from the design process and experience.

People living with dementia experience cognitive and physical limitations, and may experience explicit memory loss. However, they retain emotional memory right until the end and can experience enjoyment and fun. Research is increasingly showing that people living with dementia can have a good quality of life, and that opportunities for social engagement, and involvement in meaningful activities can contribute to positive wellbeing (Cutler 2009, Kenning 2016). The pilot research project used an inclusive design process. The designers learned from the participants and the benefit of this was reciprocated by using the design process as an activity for social engagement for people

living with advanced dementia, and as an opportunity for them to interact with materials and objects, so promoting 'in the moment' wellbeing.

Designers working in the area of design for dementia often look to pathological, clinical, and scientific views of the condition, However, it is important that salutogenic aspects are also explored and that designers gain insights into the embodied experience of living with dementia. In order to understand the very different embodied experiences of individuals it is important to take into account, for example, different types of dementia, the variety of symptoms and conditions, and different living conditions. Insights can be gained from looking at how care is undertaken and approaches that focus on embodied experiences, on the wants and needs of the individual, and how personhood is respected through person-centred and relational care (Kitwood 1997). These approaches can inform designers about how to support people living with dementia and how to design for potentiality and possibility rather than focusing on addressing deficit.

As designers, it is important to employ inclusive design methods to ensure that the wants and needs of those living with dementia and stakeholders in their care are taken into account (Treadaway and Kenning 2015). The design process needs careful consideration to ensure that it is not too long, confusing or tiring for people living with dementia, particularly those in the later stages of the disease, and that participants are not overwhelmed by the number of people they engage with during the design process. Co-design approaches also need to be able to accommodate participants who are not able to verbally articulate wants, needs, or desires; have cognitive and physical limitations; whose level of input, while important, may not be extensive; and those who may have difficulty with comprehending the role of probes and prototypes and 'future thinking' the objects, activity or service being designed.

The pilot project introduced:

- 'Reciprocal Design' which ensured that all participants (people with dementia, carers and designers) benefitted from the participation, and
- A 'Bridging' approach between the design community and people living with an embodied experience of dementia, to minimize stress on participants and maximize design research outcomes.

The 'bridging' approach addressed the need for scalability in design for dementia and the need to gain in-depth insights without causing anxiety or stress, by using a small group of trained design researchers who acted as exchangers of information and findings between the participants and designers. This meant that not all designers engaged directly with people living with advanced dementia. However, the advantage of this approach was that a larger number participants in diverse geographical locations could be supported through design within a fixed budget; that designers could gain a holistic understanding of dementia and its impact on individuals and society and insights into the embodied experience of individuals; and it ensured that participants at two residential care facilities engaged in an enjoyable, fun, social interaction without the fatigue or stress that can occur from engaging with large groups of people.

# Conclusion

The project found that participants in the study were able to engage in inclusive design according to their individual abilities, while engaging in a pleasurable and enjoyable experience. The 'Reciprocal Design' approach provided opportunities for social engagement, interaction with objects and activities, and entertainment for people living with dementia and stakeholders in their care. Importantly, the study showed that people living in advanced stages of dementia were able to participate in an inclusive group design process, which staff at the care facility reported as being unexpected and surprising. Participants living with dementia who were not able to verbally articulate likes and dislikes communicated in different ways. These included, unexpectedly moving around a table (without the aid of their walker) to engage with prototypes or objects with which they had become fascinated with, or laughing and smiling as they engaged for sustained periods of time. Designers engaged in the project reported that they benefitted from the experience and being provided with a range of background knowledge to support the design process in this way, and that is has impacted on subsequent design consulting and projects that they have undertaken.

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# QuittyLink: Involving smokers in the design of technology that supports individuals in quitting

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## Keywords

Smoking Cessation, Interaction Design, Mobile Computing, User-Centred Design, Technology Probes

## Introduction

Smoking cigarettes is a serious health risk and people who wish to quit often struggle to do so. Finding ways to help people quit smoking is a high priority in health behavior change research, because smoking related illness has an immense economic impact on society, and social impact on friends, families, and the individuals suffering and dying from smoking. Reports show that in Australia, an estimated 15 thousand people die from smoking related illness each year, costing over $31.5 billion (Australian Government Department of Health, 2015). The picture world-wide is even more dire (World Health Organisation, 2017). Face-to-face counselling is the most effective method of assisting smoking cessation, but for various reasons, people do not seek it (Smith et al., 2015).

In this study, we specifically look at how everyday technologies, such as smartphones, can increase the efficacy of health behavior change interventions through designing for flexibility and individual differences. In a user-centred approach we explored why smokers continue to smoke, or fail at quitting (Paay et al., 2015a). We used this knowledge to create the QuittyAct framework, for informing the design of health technologies that support people quitting. A prototype mobile application, QuittyLink, was created to go beyond providing information on health implications of smoking toward actively supporting individual smokers in the serious challenges that they face when trying to quit (Paay et al., 2015b).

Our research benefits governments and health organizations by providing understanding of the role technology can play in helping people quit smoking. The QuittyAct framework gives an empirical foundation for use by developers of smoking cessation apps. Additionally, through our user-centred methods and study of QuittyLink in use, we have given individual smokers a voice toward identifying the kinds of support they need to succeed at quitting.

# Method

We used a multi-method approach including focus groups, design workshops, a technology probe (Hutchinson et al., 2003), and semi-structured interviews to understand smokers' struggles to stay quit and to explore with them ideas on how technology might support quitting.

We held 4 focus groups with 18 participants (11 males, 7 females, aged 20-61, av. 11.5 yrs. smoking) who had quit smoking, were trying to quit smoking, or had no intention of quitting. We included the latter group to understand why they continued smoking, despite severe health warnings. Nine of these then participated in 2 design workshops. We analysed data using thematic analysis, and the outcome was 12 themes that underpin the QuittyAct Framework. This knowledge then informed the design of the QuittyLink prototype system. This was deployed with 13 new participants (4 males, 9 females, aged 22-52) as a technology probe for daily use over 3 weeks. During this time, participant behaviours were logged. After this we conducted interviews about their uses of the app and responses to its different features.

# Design of the *QuittyLink* App

The QuittyLink app was designed based on the empirical findings from working with smokers, related literature and an analysis of 50 existing smoking cessation apps available in app stores. QuittyLink provides different types of feedback and support for smokers to choose between (see Figure 1). The unique feature of QuittyLink is that it uses both self-tracked and system-tracked data about a person's smoking behaviours to provide weekly counselling directly to their mobile device. This personal counselling is provided by a qualified counsellor based on the tracked data from the past week. We also provided visualizations of their measured smoking behaviours, as well as daily motivations and tips, which have proven helpful in previous studies (Paay et al., 2014; Ploderer et al., 2014). The aim was both to help people to quit smoking and support them in staying quit.



|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| (a)   | (b)   | (c)   | (d)   | (e)   |
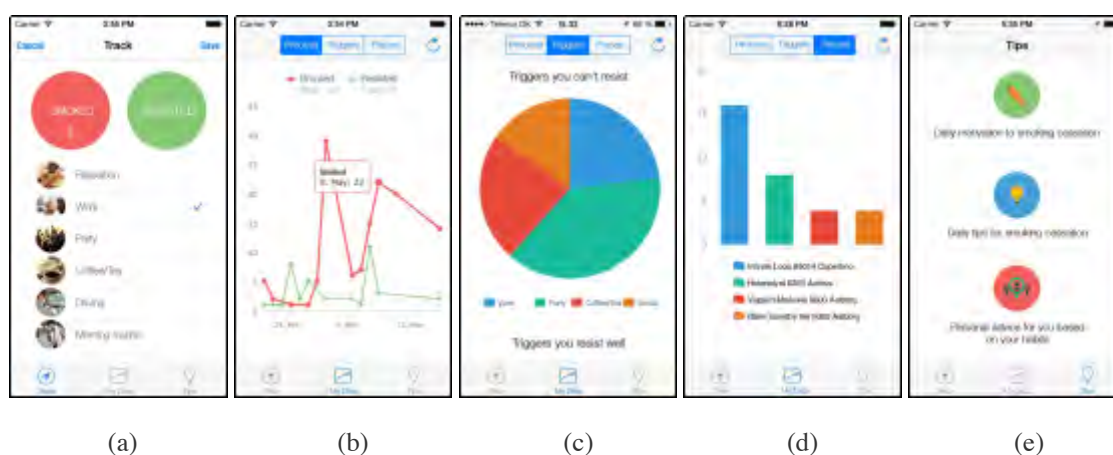
**Figure 1. The QuittyLink screens: a) registering smoking activity, b) cigarettes smoked over the past two weeks, c) triggers that make you smoke, d) places you smoke, and e) daily motivations, tips and your personal counselling.**

# Results

The focus groups and design workshops resulted in 12 empirically derived themes for tailoring smoking cessation apps to individual quitting needs. These themes underpin the QuittyAct Framework which describes activators that influence a smoker's ability to quit: Willingness To Quit; Self-Reflection; Personalised Advice; Just-In-Time Help; Access to Social Support; Prompt Don't Push; New Information; Individual Path; Doing It Alone; Immediate Rewards; Meaningful Rewards; and Winning the Competition (Figure 2).

| Quitting Activators | Implications for design |
|---|---|
| Willingness to Quit | Different quitting stages require different levels of support |
| Self-Reflection | Provide actual data on smoking habits in a form useful for self-reflection |
| Personalised Advice | Smokers need to relate to the content as if it was created directly for them |
| Just-in-Time Help | Knowing habitual triggers to smoking and intervening at that time and place |
| Access to Social Support | Include easy access to social support and interaction for quitters who benefit from this |
| Prompt Don't Push | Reminders need to be sensitive to the user's attitude, it can easily have a negative effect |
| New Information | Provide new and surprising information to attract attention and re-ignite interest to quit |
| Individual Path | Provide flexibility for users to access different kinds of help as needed while quitting |
| Doing It Alone | Provide quitting advice that can be used by individuals, on their own, under their control |
| Immediate Rewards | Benefits and compensations for quitting should be immediately evident/available |
| Meaningful Rewards | User defined suitable compensations can counteract the attraction of smoking |
| Winning the Competition | Competition with others, or with themselves, can be a key motivator to help quitting |

**Figure 2. The QuittyAct Framework: informing design of smoking cessation mobile applications**

In addition to these user studies, the use of QuittyLink as a technology probe gave us a lot of actual information about smokers' habits, that was represented to users through visualisations and personal counselling. All of our participants reported that the app made them more motivated to stop smoking. All found it extremely helpful to get information about their actual smoking patterns, so they could see actual progress in their quitting attempt. The 8 participants who were serious about quitting found the provision of personal counselling on their own phone convenient, motivating and helpful. The others felt pressured by it. However, they all preferred the convenience of receiving counselling on their mobile phones rather than having to go and see a counsellor face to face.

# Discussion

What came through strongly in this study was the importance of flexibility and the individualization of a smoker's quitting journey. Smokers require different kinds of support, compensations and information to succeed in their personal journey. Some want to be able to know their actual smoking habits so they can reflect on this in order to enact change. Some are deeply affected by the stories of others. Some need a personal support network, while others prefer to go it alone. Studying the use of QuittyLink in their everyday lives showed that smokers are highly individual in their approach to quitting, and in the kind of help they regard as relevant to their situation. It showed how much time, place and activity impacts on their smoking habits, and that having the ever-present mobile phone as a quitting tool really helped. This indicates the great potential that mobile counseling holds in reaching people who need it.

# Conclusion

What we achieved was to identify and describe how different types of quitting support are perceived and experienced by smokers when trying to quit, and to illustrate the significant and effective role that technology can play in providing smoking cessation assistance.

# Limitations

As QuittyLink was deployed for such a short time, and with few people, a longitudinal study of this in use, with more people, would add validity to our findings.

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# Communication design project: Redesigning medicine administration for the elderly in Hong Kong

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## Keywords

Ageing, Elderly, Hong Kong, Medicine label, User-centered design

## Introduction

Today, the ageing population is subject of discussion and inquiry across the world, also in Hong Kong. The Census and Statistics Department has predicted that, by 2036, Hong Kong will be home to an estimated 2.37 million people that are 65 years of age and older. This figure suggests that there are challenges ahead in dealing with an ageing population. An important factor is an expected increase in medication administration.

It has been found that elderly people in Hong Kong, especially those who live alone, easily make mistakes when administering medicines. Without doctors or friends around to help, these older patients have to struggle with small print (WHO 2007) and poor organisation of information, specifically on medicine labels of Hong Kong's public hospitals.

There is a need for medicine labels to be improved and re-designed. Designs of medicine labels should not be seen as simply sticker designs that present information. Instead, they should be approached through user-centered design that takes into consideration usability, understandability, and accessibility for all users—particularly for elderly.

In response to the observation that Hong Kong's medicine labels involve difficult small print and poor organization, Communication Design students in the School of Design of The Hong Kong Polytechnic University were asked to redesign the Hospital Authority's current medicine labels. These are the labels that most of Hong Kong's elderly are familiar with. In addition, students were required to present a new design concept for medication administration, not only focusing on the label but also on the context in which medication is administered. Unlike conventional design training where students develop designs from their own perspectives, elderly participants were invited to act as "co-designers". They gave comments and evaluated students' prototypes throughout the iterative design process. In addition, students were required to do home visits in order to better understand the everyday needs and problems of the elderly participants. In this design project, therefore, students developed different design solutions that catered to the elderly's needs. For instance, they developed a set of new symbols for people who are low literate, they designed accessibility enhancements for medicine labels, and they generated new design ideas for medication administration. The examples are briefly introduced below.
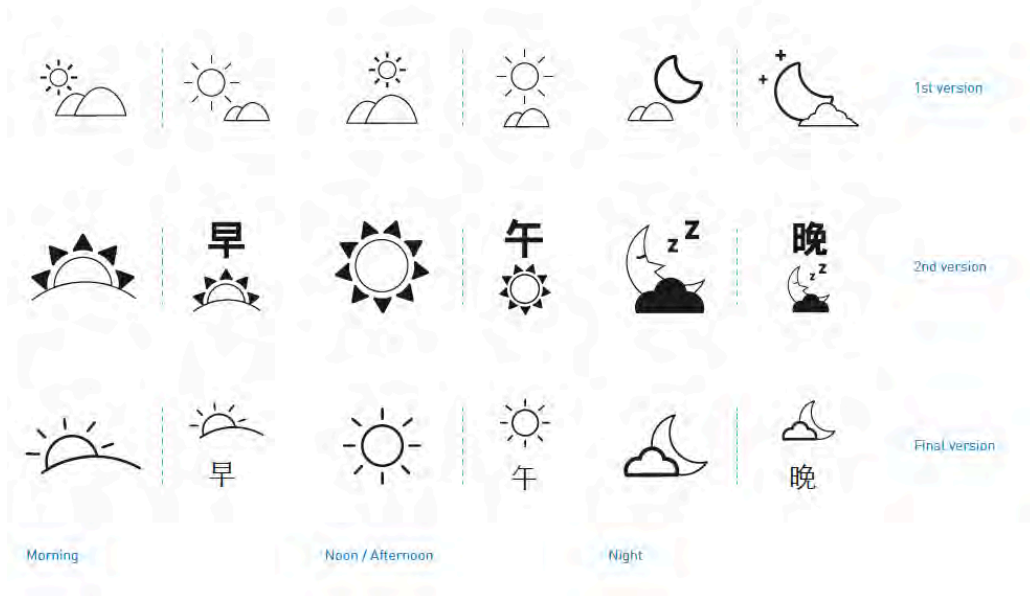
**Figure 1 Symbols on medicine labels**

The above time indicators for medicine-taking are presented in the form of pictograms. They specifically cater to those elderly who are illiterate. Students: Cheng Man Nam, Chong Wing Ching, Chung Tsz Yan and Ho Cheuk Hei.

Symbols are considered universal because they are not bound to any language. Rather, they are considered to "speak a universal language" (Horton, 2005). Besides their decorative character, symbols are used to convey instructions and to communicate atmospheres and experiences.

A set of symbols was developed to meet the needs of those elderly who are low literate. The original medicine labels are fully text-based while illiteracy still exists among Hong Kong's older generations. After collecting and analysing the elderly participants' feedback, students developed symbols for schedules, dosages, and routes of medicine administration.
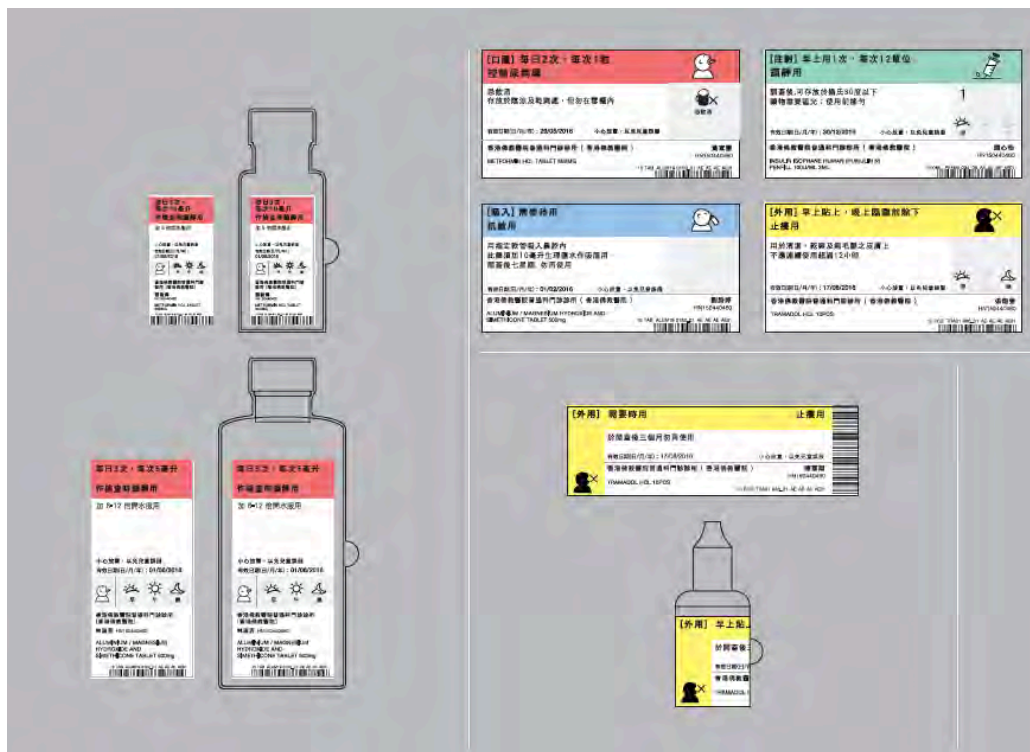
**Figure 2. Redesigning medicine labels**

This set of medicine label prototypes makes use of colours for better accessibility of medicine information. Four colours are used to indicate oral intake, external application, injection, and inhalation. Students: Chan Hiu Ying, Chan Wang On, Ng Sui Man and Tsang Hiu Tung.

By the end of the class, students were able to propose a new set of medicine label designs that was both more legible and more accessible than the original labels produced by the Hospital Authority. The new designs were developed for a range of different medicine containers such as bottles, plastic bags, and ointment boxes.

**Figure 3. User-centered design for medicine labels**

Home visits are crucial when attempting to better understand the everyday needs and problems of elderly patients. The above (bottom) image shows that one of the elderly research participants used two medicine boxes with hand-written indications reminding him or her which medicines to take in the morning and which at night.

Students were trained in conducting basic qualitative research, using methods such as home visits, interviews, and card sorting. Those methods helped students to understand user perspectives and work out design solutions accordingly.
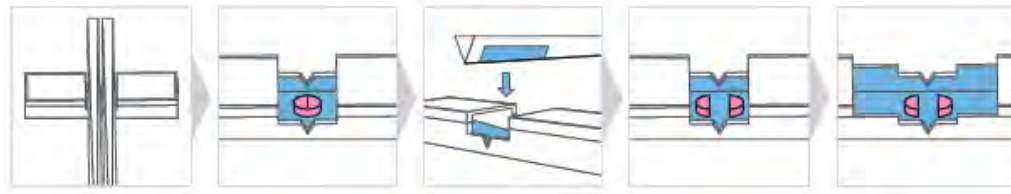
**Figure 4. New experiences of medication administration**

MediUtensils are Chinese-style tableware that help elderly to take the right dosage. This tableware is designed to remind elderly users to take their medication on time. Students: Fan Shui Lun, To Kam Chi, Yeung Yan Yi and Shuen Po Chi.

When a product or service is described as usable, it means that a user can do what he or she expects to be able to do, without frustration and hesitation (Rubin and Chisnell, 2008). After 13 weeks of user studies and different rounds of testing prototypes, students were asked to propose a final prototype that responds to the needs of elderly users. Different positive attributes—secure, safe, reliable, respectable, and enjoyable—were taken into account in the development of the prototype.

# Conclusion

User-centered design was introduced in the communication design curriculum to train students in working with particular users—meeting their needs in specific contexts of use. In the process, students were encouraged to strive for relevance, usefulness, usability, understandability, and attractiveness. In the 13-week information design course, students had a chance to co-design with elderly citizens for the first time. They came up with new ideas and developed prototypes that improved the experience of medication administration, specifically the experience of a growing group of elderly people.

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# Thick care: Designing for an ethic of care and complexity in community aged care services

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## Keywords

Ethic of care, complexity, home care, older people, designing for service

## Introduction

This paper examines the links between complex service systems and care and the idea of *thick care* is introduced. Thick care is a term coined by the author and its context lies in research that investigates what it means to design for services where the foremost virtue is an ethic of care and when service systems are becoming ever more complex. The paper contributes to the efficacy of complex service systems that deliver care to older people in Australia. It summarises the argument underpinning thick care with a focus on how the concept ensures better outcomes for peoples' experience of community aged care.

## Community aged care in Australia

Aged care in Australia happens through a collaborative system based on various levels of federal and state government, service providers from the for profit and not-for-profit sectors, and informal community and family support. In addition to residential aged care, the aged care system provides assorted services to elderly people within their own home or in other community settings (Wells & Regan 2014, 103-106). Most older Australians live at home, not in residential care and during the 2010-11 period, 719, 300 received some form of in-home or community care service (Australian Institute of Health and Welfare 2013, 238). Structural changes in Australia's population will see its aged population continue to increase in size and heterogeneity. The Australian Bureau of Statistics (2013, 3-44) projects this group as a percentage of the total Australian population will be 22 percent by 2061. It further expects the number of people aged 85 years and over to grow rapidly, projecting they will be 5 percent of Australia's population by the same period. Recent sector reforms seek to respond to these projections with service changes that ensure older people remain independent and living in their own homes for longer.

## Independence, dependence and interdependency

Independence is a widely held ideal associated with older people and is a promised outcome of community aged care. Care is a constant detail of being human (Held 2012, 1-28) and over the life course it takes many forms, but these variations obscure how prevalent care is. This masks dependence, and independence is assumed. Old age is an undeniable period for greater need and inevitable dependency (Hale, Barret & Gauld

2012, 271-275). Independence is a myth (Albertson Fineman 2004, 31-44) that misrepresents the interdependency inherent in care and the service systems that deliver it. In the case of community aged care, shifting from promising more independence toward ensuring *better interdependence* aligns community aged care services with the nature of care *and* complexity, resulting in better service outcomes for older people.

## Service system complexity

Community aged care services require equivalent understanding of care *and* complexity. Services are increasingly framed as a type of system (Ng, Maull & Smith 2011, 13-35); however, typical methods of designing for service have inadequate scope for interrogating the non-linearity of complex systems, limiting services development accentuating linear processes and dyadic interactions. Complex service systems behave simultaneously and at varied system scales (Cilliers 1998, 1-24). Owing to the interdependency of system parts the critical variables of care are affected.

**Thick care**

My idea of *thick care* is conceived from an overlooked association in the literature about care, design for service and systems thinking theory. Care and complex systems have a common ontology that is based on relationships and interdependence, both being central to producing meaningful service outcomes for older people. Thick care combines key systems thinking concepts (Checkland 1999) with an ethic of care (Tronto 1993, 125-155) (Table 1).

| System elements | Care elements |
| --- | --- |
| purpose | Attentiveness |
| equifinality | Responsibility |
| regulation | Competence |
| interconnectivity | Responsiveness |
| boundary | Solidarity |
| emergence | |

**Table 1. Thick Care elements**

Thick care is possible only when complex systems note the affects and effects of system structure on older people's experiences of care. The benefits of combining these theories when designing for services that deliver care is twofold. First, the care elements provide a way to plan and monitor for the presence or absence of care at any stage of an older person's experience at any scale of the service system. Next, systems thinking concepts make room for a causal understanding of this presence or absence of care by

interrogating system structure effects. The idea of thickness in care indicates a form of care that is viewed as a whole system concern. Thick care extends past the dyadic of a care giver and care receiver and fine tunes care as an approach to service delivery that spans macro, meso and micro system scales. Applying thick care for understanding peoples' experiences of community aged care highlights where a service delivers sufficient or insufficient care (Figure 1).
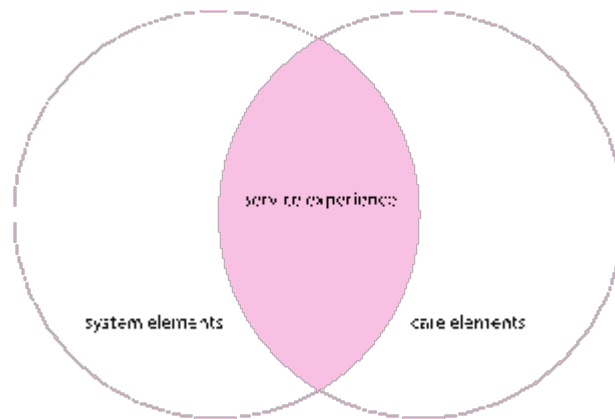


**Figure 1. Meta-representation of thick care**

# Conclusion

In the provision of community aged care, a thick care framework contributes heuristic value to design and health for ensuring better interdependency. Design for service benefits from the framework's potential to create experiences of care informed by an awareness of whole system interdependencies and relationships. Service providers will gain from using the framework retrospectively to monitor whole system alignment to care to ensure better service outcomes for older people.

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# Creating a personalised self-management system for post stroke rehabilitation; utilising a user-centred design methodology

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## Keywords

user centred, participatory, design, rehabilitation, stroke

## Introduction

The global incidence of stroke is set to escalate from 15.3 million to 23 million by 2030 and with the decrease in mortality and rise in morbidity, more stroke survivors will be living with long-term disability. Research suggests that long-term, intense, task-specific, context-specific, goal-orientated, variable, environmentally enriched post–stroke rehabilitation improves function, independence and quality of life (Intercollegiate Stroke Working Party, 2012, 2015).

The UK National clinical guidelines for stroke (RCP, 2016) provide evidence and recommendations for the commissioning and delivery of services for individual stroke survivors and their families. The guidelines cover the acute phase of management, secondary prevention, the recovery phase and rehabilitation followed by the long-term management after the stroke. Whilst there is significant evidence to support rehabilitation post discharge, delivered by Early Supported Discharge teams (ESD) and Community Rehabilitation Teams (CRTs) due to increasing demand on services and financial constraints within health and social care, service needs cannot be met. A resent national audit of stroke services (RCP, SSNAP, 2017) reported evidence of wide spread variations in the nationally commissioned portfolio of post stroke services with 'too many areas failing to commission comprehensive care'.

With this increasing demand on services, financial constraints and an overwhelming amount of evidence for change, this project responded by proposing a radical innovation with the adoption of a self-management paradigm as a way of delivering home-based rehabilitation thereby re-positioning the patient and carer as central to both the design and delivery of their own care.

# Purpose

We wished to deepen our understanding of the potential for digital technology to support the self-management of stroke rehabilitation, through an iterative health, social care and user centered design methodology (Wright and McCarthy. 2010). We designed a Personalised Self-management Rehabilitation System (PSMrS), a prototype integrated with sensor technology, developed to enable stroke survivors to self-manage their rehabilitation with motivational feedback enabling them to achieve identified individualised life goals (Mawson et al 2016). The PSMrS consists of a personal computer 'Home hub', a Smart phone, a server and an intelligent sensorised insole. The initial concept involved the system providing feedback to the stroke survivor, their carers, and the clinical multi-disciplinary team within community rehabilitation centres. The Personalised Self-managed Rehabilitation System (PSMrS) was designed to translate current models of stroke rehabilitation and embed theories underpinning self-management and self-efficacy into an ICT-based system for home-based rehabilitation post stroke.

# Methods

The design and development of the PSMrS involved a complex user centred, participatory process which aimed to:

1. Translate current models of stroke rehabilitation into a technology based system.
2. Design a system that integrated 'life' goals that reflected the needs of the individual stroke survivor.
3. Explore whether a technology solution that recorded walking ability could be integrated into a personalised system to provide motivational feedback on the attainment of key walking characteristics.
4. Design motivational feedback screens that could translate complex biomechanical data into simple conceptual images.

We undertook a series of home visits, focus groups, in-depth interviews, cultural probes (Gaver, et al. 1999) and technology biographies (Blythe, et al. 2002) together with cooperative evaluations during the iterative design process. This user-centred approach to design was utilised as a holistic approach in order to understanding firstly, the users experience of technology and secondly to ensure that we had a meaningful engagement with the users in co-designing the technology.

# Results

We explored different ways of providing post stroke rehabilitation within a stroke care pathway and how they might be translated into an ICT based system underpinned by theories of motor relearning, self-management and behaviour change. The design methodologies used in this project have ensured that the interactive technology developed has been driven by the needs of the stroke survivor and their carers in the context of their journey to recovery or adaptation. The participatory and user centred nature of this work has resulted in a personalised system for self-managed rehabilitation

which has the potential to change motor behaviour and promote the achievement of life goals for stroke survivors.

## Discussion

From a pragmatic perspective, we have placed the 'person' at the centre of the design and development process, from a moral perspective we have shifted the responsibility of care from the service provider to the stroke survivor and their carer. In doing so we have responded to the unmet need for long-term stroke rehabilitation and the societal challenges we currently face within health and social care.

The iterative design and development of both the content of the PSMrS and the interactive interfaces between the system and the user incorporates current models of post-stroke rehabilitation and addresses the factors that promote self-managed behaviour and self-efficacy such as mastery, verbal persuasion and physiological feedback.

## Conclusion

The methodological approach has ensured that the interactive technology has been driven by the needs of the stroke survivors and their carers in the context of their journey to both recovery and adaptation. Underpinned by theories of motor relearning, neuroplasticity, self-management and behaviour change, the PSMrS developed in this study has resulted in a personalised system for self-managed rehabilitation, which has the potential to change motor behaviour and promote the achievement of life goals for stroke survivors.

## Implications

Radical innovation and the adoption of a self-management paradigm need to be considered as a way of delivering home-based post-stroke rehabilitation.

A hybrid of health and social sciences research and user-centred design methods are required to ensure that technology for post-stroke rehabilitation has been driven by the needs of the stroke survivors and their carers.

## Limitations

We still need to understand 'What works, for whom, why, how, in what respect and under what circumstances'? In order to explore these questions we need to undertake a Realist Evaluation (RE) approach (Pawson and Tilley, 2010) to evaluate the final prototype PSMrS in order to explore in depth the value, usability and potential impact such technology could have on an individual's ability to self-manage their rehabilitation following a stroke.

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# Designing for emergency departments: A literature review

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## Keywords

Co-design, healthcare innovation, emergency department design.

## Introduction

Between 2014-15, just over 20,000 people presented to Emergency Departments (ED) in public hospitals in Australia each day, close to 7.4 million people across the year (AIWH Et. Al, 2016). Like other parts of the health system, the ED must meet the challenges of an unprecedented ageing demographic, a growing population living with chronic diseases and the growing cost of medical technology (AIWH Et. Al 2016; WHO 2011). These challenges are interconnected, systemic and wicked, and must be addressed in order to deliver sustainable healthcare into the future. In this sense, healthcare is no different to any other public sector in that in order to meet these challenges it must innovate (Porter and Lee, 2013). This paper provides a literature review of innovation in healthcare through co-design, and evaluates the strengths and limitations of design when positioned from the 'top' or 'bottom' of an organisation, with a specific focus on meeting the unique challenges of the ED. The ED is a unique component of the hospital system in that patients enter a fast-paced, chaotic environment that is typified by high volume, high acuity and emotional patients with visible injuries (Glasby 2003; Hoogerduijn et al 2007; Lafont et al 2011). Unlike other parts of the healthcare system, the role of the designer in the ED is particularly challenging in that they must design for the chaotic 'unwell' episode, and consider a number of different use scenarios.

Designers are not yet considered professional caregivers, but are playing a vital role in the emerging paradigm of contemporary innovation in healthcare delivery (Jones, 2013). Design plays a role in successful innovation - whether a product or systemic change - and serves a primary role that can rarely be substituted by other disciplines. *In the complex healthcare environment, the review suggests there is benefit in adopting a 'co-design' approach by the designer*; and work with other known domains of information technology, interaction design and communications in order to bring human-centered design thinking to clinical practice. The need for this kind of thinking - and the necessity for highly qualified designers working in healthcare - is growing rapidly. Design methodology plays a role in integrating and applying knowledge between these known domains, and ensuring the development of a patient-centered care model.

Understanding healthcare is complex and learning even one small part of a vast field is a significant undertaking for the designer. Learning and working across sectors is a

career challenge, and the clinically-trained designer is unheard of (Jones, 2013). The designer must position themselves in relation to the healthcare institution. For this reason, innovation and design in healthcare requires collaboration, which is a widely-researched topic in organizational and change management studies (Kanter M, 1994; Gray B, 1989), and significant co-design literature supports this approach (Antti, P 2016; Bate and Glenn, 2007; Reay Et. Al 2016). The tension created by multiple disciplines working together forces the boundaries of thought to change and enables the group to see beyond their own limited view. This is able to generate new, unexpected insights that increase the potential for innovation. Kanter (1994) calls this the 'collaborative advantage'.

The design of new service architectures for the emergency department - such as rethinking triage, discharge or transfer of a patient to an inward bed - are an example of a 'top-down' design approach. At this level, the design is stakeholder driven - and requires significant input from healthcare providers, patients and designers. Innovation and change from this position cuts across systems - both inside and outside the ED - and challenges the designer to become a 'convenor' in order to manage a multi-stakeholder network. In the ED in particular, this is difficult as patients spend relatively little time in the department and do not develop an ongoing sustained relationship with the service. Generating ongoing engagement with staff and patients in the ED is a significant limitation of this approach (Piper et al 2012). Additionally change "top down" is studied significantly elsewhere can be perceived as imposing, autocratic and threatening (Anderson and Anderson, 2010). The designer must be careful to balance the expectations of stakeholders when positioning themselves in this way.

A 'bottom up' design approach to innovation in healthcare can curtail many of the challenges of a top-down approach, but is not without its own limitations. From this position, the designer is developing innovative human care systems in the form of products, artefacts and experiences. Common examples of work from this position is to design the patient experience of service, electronic medical records (EMR), patient portals, information workflow, product-service experiences, wayfinding and infection control. This approach relies on individual design skills of the designer: form-giving, illustration, and representation to define and finish desired products (Reay Et. Al 2016; Mayo Clinic Center for Innovation, 2017). User research into behaviours is often necessary to ensure useful and usable products, but the vast majority of the design process is performed invisible to stakeholders. This approach is limited however, as even the most radical breakthroughs in these forms only incrementally improve services and experiences of care. Due to cost of new things and the risk averse nature of the healthcare industry, bottom-up change is often limited by its impact.

If neither a 'top-down' or 'bottom-up' approach is without limitation, perhaps a better way to innovate healthcare might be found by combining the two and designing human-centered care systems that are connected with health policy and the artefacts which facilitate service delivery. Designers must find a new position to take, and contribute at each level of the healthcare system: from the formulation of health policy to the clinical encounter. We need to connect the people who create products that are designed to fit within a service, and those who design the services themselves. To do so, might require

a deeper understanding and stronger links between healthcare research, healthcare design and design science research more generally.

In the high-stress and chaotic context of the Emergency Department, effective, ethical and considered design for healthcare is not just making things work better for end users. Design must also be empathetic, and respectful of the personhood of every patient. To do so is to support a 'culture of care', and systematically design the patient experience into the emergency healthcare service. In the Emergency Department, design methodology is positioned to parse the complexity of the environment and still propose interventions which enhance the health outcomes and experiences of users.

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# Kids in the waiting room: Lessons from Melbourne's Royal Children's Hospital

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## Keywords

paediatric hospital design, distraction strategies, affordance theory, outpatient clinic absenteeism

## Introduction

A child walked into Melbourne's Royal Children's Hospital (RCH) recently, sighed, and announced: "It's good to be back."[1] The inclusion of architectural distraction strategies—such a movie theatres or radio stations, artworks and playgrounds—are broadly recognised as best practice in the construction of new facilities for paediatric healthcare. Positive distraction affords a diversion from stresses associated with a hospital visit and is, therefore, contemporarily valued for what it prevents: without "environmental stimulation…patients may focus to a greater degree on their own worries or stressful thoughts…further increas[ing] stress" (Ulrich 1991, 102).

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[1] *Personal correspondence with the mother of two boys (aged 6 and 9), Specialist Clinic. Waiting Room, RCH, 14 June 2017.*

Positive distraction has been defined as "an environmental feature that elicits positive feelings and holds attention without taxing or stressing the individual" (Ulrich 1991, 102). This definition implies that what is significant about distractions is their ability to "hold attention" since it is the act of paying attention that prevents the build-up of stress and correlates with a positive impact on wellbeing. This paper reports on preliminary findings from a study conducted with children and young people in a contemporary hospital waiting room, which challenges contemporary understandings of the value of distraction, suggesting instead that the most significant contribution design can make to wellbeing may be the ability to ignite curiosity and stimulate a desire to return. While absenteeism from outpatient appointments can result in direct costs to patient health (Andrews et al, 1990; Cameron et al, 2014; Geiger, 2015), anecdotal data suggests that patient distress related to an outpatient appointment may play a role in parental decisions not to attend follow up appointments.[2]

## Method

This paper draws on preliminary data collected from 234 children (predominantly within the outpatient clinic waiting room) at Melbourne's Royal Children's Hospital including: 173 survey responses, 18 photo-response interviews, 65 hours of hours of waiting room observations and drawing exercises with 40 patients / siblings. The first drawing exercise asked patients to "draw their ideal hospital" and the second to "storyboard their typical

hospital visit." These research methods were designed, and subsequently refined, to interrogate whether in the context of a children's hospital the actual experience of a distraction (such as a movie theatre)

[2] *Interview with Ron Billard and Mark Mitchell, Billard Leece (architects in association on RCH), 05 April 2017. Note while little specific research was able to be identified for paediatric settings, patient fear and distress has been identified as a contributor in adult absenteeism from outpatient appointments (refer, for example, Lacy et al 2004).*

is as important as the knowledge of its existence. Studies of the benefits of social support, for example, suggest that the perception of availability might sometimes be enough to perform a wellbeing roll. Pretty et al (1994) has suggested that in the case of adolescent patients, accessing social support may not be as important as the perception that a community for support exists should an individual desire to access it.

# Findings

From a patient perspective, the nature of what happens in a paediatric hospital hasn't changed all that radically over the years. Survey data confirms that waiting is still a drag and medical procedures are still painful. Percentages of absenteeism at outpatient clinic appointments have dropped following RCH's relocation to its new facility (completed in 2011).[3] What has been transformed over recent years is the expectation of what going to hospital entails. There is a clear consensus amongst children who frequent RCH that the meerkats' enclosure, the fish tank, the movie theatre and the interactive (wall-mounted) gaming screen rank highly amongst the hospitals main attractions. Yet we found minimal correlation between what children and young people told us they liked doing while visiting the hospital and how much of their time was actually spent engaging with these distractions. These findings echo through the ideas the design team were thinking about, that for children distraction comes, in part, from the perception that there are lots of other children around, lots going on and lots to do.[4] Worthy of

[3] Interview with Ron Billard and Mark Mitchell, Billard Leece (architects in association on RCH), 05 April 2017; please note the authors are currently in the process of confirming this anecdotal data with RCH.

[4] Interview with Sheree Proposh, formerly of Bates Smart (architects in association on RCH), 23 August 2017.

recognition here is that benefits to wellbeing may be secured by the perception that there are socially based activities on offer should children and young people feel like engaging with them.

# Conclusion

Within paediatric healthcare settings architecture's capacity to shape expectations warrants greater recognition in contributing positively to patient and parent wellbeing.

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# Evidence and borrowing: Conversations with 8 architects on the use of evidence and innovation in the design of contemporary healthcare facilities

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## Keywords

evidence based design, paediatric hospital design, palliative care facilities, oncology facilities, hospice design

## Introduction

Evidence Based Design (EBD) seeks credible evidence to support decision making in the design of healthcare facilities toward architectural solutions that aid the healing process for patients and improve staff performance in ways that correlate positively with patient safety. The relative nascence of this field of research combined with the approaches taken to obtaining evidence, that tend to test isolated variables in the pursuit of 'evidence-based building blocks for design practice', results in several gaps within the evidence based design guidelines contemporarily available (Nanda, 2013, 74; author reference removed for peer review, 2016).

Management scholars Bennis and O'Toole (2005) have cautioned against the risks of evidence based practice, specifically in situations where evidence is incomplete. They caution that the 'gradual accumulation of tiny facts' in the pursuit of greater scientific understanding does little but force practitioners to make decisions based on the limited information available to them with the risk of 'overweighting' the value of this knowledge. Similarly, critics of Evidence Based Medicine, in reflecting on this building block approach within the clinical field, have argued that for evidence to be of substantial value within real world settings it should include, and account for, the 'patient's experience of illness and the real life clinical encounter for different conditions and in different circumstances.' Furthermore, that we need to gain a better understanding 'of how clinicians and patients find, interpret and evaluate evidence … [and how] these processes feed into shared decision making' (Greenhalgh, Howick and Maskrey, 2014, 5). Critics advocate for greater recognition that evidence based practice, within medicine, should not be bound by rules but characterised by 'rapid, intuitive reasoning informed by imagination, common sense and judiciously selected research evidence' (Greenhalgh, Howick and Maskrey, 2014, 3). What might the issues identified by these scholars mean for EBD?

There are unanswered questions relative to the weight given to evidence based decision making in preference to, or combination with, intuitive forms of decision making and how innovation occurs within an environment where evidence is increasingly valued. Intuition is broadly acknowledged as a key component of architectural practice (Lundin, 2010; Gehry 2007). Khatri and Ng (2000, 59) have pointed out the value of intuition for

complex decision making and suggested that while intuition emerges from a subconscious process it is 'not the opposite of rationality.' Instead it is the result of years of experience solving problems within a particular field. We interviewed 8 architects involved in the design of 3 significant and architecturally celebrated contemporary paediatric hospitals in Australia about their use of evidence within the design process: Melbourne's Royal Children's Hospital (2011) Brisbane's Lady Cilento Children's Hospital (2014) and Melbourne's Monash Children's Hospital (2017). The findings give insight regarding which types of evidence are being accessed and employed within the design process and also how this evidence is being interpreted and translated into built form. It reveals the strategies designers are using to supplement gaps within EBD guidelines and suggests new lines of inquiry for this field of research.

## Methods

In differentiating between the value of varying forms of inquiry, Markauskaite and Goodyear (2016) have suggested that 'illuminative inquiry'—that which produces knowledge by examining a phenomenon within its broader context—identifies the real-world limitations of implementing best practice. Interviews with healthcare designers can account for the full range of complexity that shapes design and construction; this data is not disconnected from concerns of budget, deadlines, procurement types, the policy environment or inter-personal challenges.

This paper draws on research from a larger study that seeks to understand, through a mixed-method, comparative study across 3 sites, optimal design approaches to wayfinding, social spaces and provisions for nature and distraction within contemporary Australian paediatric hospitals. Specifically, it will draw on data obtained within interviews conducted with 8 architects regarding their design approach and match this against preliminary data collected from the first of the 3 case study hospitals to validate the success of this approach. The data includes: surveys of patients, caregivers and staff (765 total), 65 hours of observations of public spaces and waiting areas, 20 photo-response interviews with inpatients and drawing exercises conducted with 36 outpatients / their siblings. Finally, the wider applicability of findings from the paediatric context will be examined relative to the design approaches taken to 2 healthcare facilities recently designed for adult patients: Melbourne's Victorian Comprehensive Cancer Centre (2016) and Glasgow's Prince and Princess of Wales Hospice (currently under construction).

## Findings

While architects tended to cite Antonovsky's theory of salutogenesis (1979) alongside theories of restoration and biophilia, they also discussed a tendency to look sideways in understanding how to approach the design of a paediatric hospital. Borrowing from other typologies, knowledge bases and disciplinary understandings, in order to more richly inform design solutions for healthcare. Examples of this included architectural precedents such as art galleries, the house that architect Alvar Aalto designed for himself, Louis Kahn's Salk Institute and traditional vernacular construction; alongside various philosophies both from architecture and beyond, the writings of Juhani Pallasmaa, for example, and 'Reggio Emilia' from the field of education. This was

particularly prevalent where architects came to hospital design with no previous experience designing this typology. Preliminary findings regarding the perceptions of hospital users supports the validity of this approach, providing evidence for the value of borrowing in the pursuit of innovative responses to hospital design. The 2 adult case studies examined also employ this strategy of borrowing, suggesting this is happening more widely in healthcare and that it is a valid approach in the pursuit of innovative design practices within this field.

# Conclusion

This paper contributes an understanding of how EBD guidelines are impacting architectural practice in the design and construction of contemporary healthcare facilities, and the ways in which innovation is being achieved in a context where increasing value is being placed on evidence based practice.

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# ICU journey: Humanising the patient experience of Intensive Care

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## Keywords

Intensive Care, humanising patient experience, personalising patient experience, patient care, Orientation.

## Introduction

Intensive Care Units (ICU) are spaces designed to look after patients with life threatening conditions; they provide life-support, extensive therapies and continuous monitoring aiming to preserve life and return patients to good health. Despite this, the mortality rate is high (Critical Care Statistics. 2017). The clinical intensity and invasiveness of this highly medicalised and technology-dependent environment can be intimidating and threatening for patients. Moreover, the patient's physical and mental condition—compounded by medication—can make them vulnerable to disorientation, sleep deprivation and hallucinations, the effects of which remain with the patient long after their medical recovery. Ensuring that people have a positive experience of care is one of NHS England's National Outcomes Framework key domains. Achieving this is a challenge in most ICUs (Framework Domains. 2017).

Working in partnership with four hospitals in England, we have co-developed a tablet-based application—called Senso—aiming to reduce the psychological effects of Intensive Care by enabling clinicians, carers and patients to personalise some aspects of their environment.

## Background

The collaborative team of designers and clinicians have undertaken a 24-month long project looking to improve the experience of patients and relatives in ICU. The project laid out the foundations for a new scalable solution aiming to address some of the major problems experienced by patients going through ICU.

Drawing from previous research and anecdotal evidence from staff and patients at the participating hospitals, the starting point for the research team was to bring balance between the heavily medicalised ICU environment and the basic, yet complex, emotional needs of patients and carers.

Research shows that a great number of patients suffer from hallucinations and delirium, leaving them in a state of confusion and disorientation, exacerbated by the difficulty they have in sleeping; noisy and often over-lit wards make matters worse (Avinash Konkani, Barbara Oakley 2012, 522.e1–522.e9). It is well documented that a high

percentage of patients suffer from psychological disorders even years after being discharged from ICU (Post-traumatic stress disorder after intensive care. 2013).

## Methods

The project was structured around the *'Double-Diamond'* framework—a research and design methodology involving four stages of divergent and convergent thinking (Design Council. 2005)—and divided into two 12-month phases.

During the first 12-month phase, the team performed primary research in four hospitals in England. The team developed an understanding of the problem from the point of view of different stakeholders including patients, relatives and clinicians. Findings were clustered in ten areas:

1. Orientation
2. Sleep deprivation
3. Motivation
4. Anxiety
5. Involvement of relatives
6. Dignity
7. Communication
8. Boredom
9. Hallucinations
10. Senses

Further analysis through co-design workshops distilled three design questions:

**Positive sensory disruption:** How might we stimulate the patient's senses in a positive way in order to help reduce the incidence of hallucinations and delirium, and improve the overall experience of the ICU journey?

**Orientation:** How might we help patients overcome disorientation and confusion and establish a personalised routine that draws insights from their preferences and normal activities, supported by relatives and staff?

**Information and space utilisation:** How might we help carers and relatives better navigate the ICU environment and understand the key role they might play in delivering care for patients?

Guided by the experience of a steering group, the second phase of the project explored creative solutions to answer the briefs. Through co-design workshops involving a ICU Patient Support Network Group, the team prototyped and tested ideas. After two cycles of iteration, requirements for a minimum viable product were outlined.

## Outcome

The outcome is a digital application that provides a personalised sensory experience for the patient named Senso. The first version has been designed for patients going through

planned admissions; future development will focus on the more challenging needs of emergency patients.

To initiate Senso, patients go through an onboarding process preoperatively; this includes the selection of images, sounds and smells that will be made available to them in the ward. A key objective of this process is to help patients understand the ICU environment prior to admission.

After onboarding, Senso generates a moodboard from the selected images and videos. This not only provides a familiar view for the patient but can also help staff to engage personally with the patient. A daily schedule helps relatives understand the patient's day-to-day activities and progress. Furthermore, Senso provides patients with a daily routine, supporting them through their journey from leaving the operating theatre through to the point of discharge from ICU. Our hypothesis is that by providing structure to the patient's day we will help in orientation and engagement.

## Results

Feedback sessions were conducted with ten patients (5 females and 5 males) staying in ICU between 24 hours and 7 days. Sessions consisted of a structured questionnaire about their current ICU experience followed by a demonstration of the application. Responses were encouraging, patients thought Senso may improve their stay by reducing anxiety and providing better orientation. An additional focus group session with five participants aimed to evaluate the onboarding process. The session was further informed by a structured questionnaire, which helped to draw key insights for the next phase of development.

## Next steps

Initial testing indicates that Senso has potential to improve outcomes. Our work has been recognised with the Environment of Care Award in the 2017 Patient Experience Network National Awards. The team now aims to perform wider testing and improve the application. A route for testing will be to make Senso available to the wide network of ICUs that have shown interest in our research so they can offer it to their patients. Further funding is being sought for this and to develop a version for emergency admissions.

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# Designing creActivities: Creative Methods to engage young people experiencing psychosis in co-design

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## Keywords

co-creation, co-design, methods, youth engagement, psychosis

## Introduction

Young people rarely seek help for mental health problems, but early education and support from services is essential to improve their long-term prognosis (Rickwood, Deane, and Wilson 2007). Currently, most mental health information available varies widely in content and quality, is inconsistent and not patient-centred (Raynor et al. 2007, Pollock et al. 2004).

Experts in early psychosis intervention identified a need for an online patient-centred resource to support youth experiencing psychosis. Psychosis refers to a range of experiences such as hearing, seeing, feeling, and believing things that are not real to other people, and may be associated with mental health conditions such as schizophrenia and bipolar disorder. People often have their first experience of psychosis in their late teens and early twenties. Here, we describe creative methods developed to engage this group in a co-design project.

## Youth as design partners

Making young people equal partners in decision-making regarding issues that affect them is crucial for successful solutions. Young people find traditional methodologies to engage adults (such as surveys and interviews) boring and intimidating, and those tailored to children patronizing (Bassett et al. 2008). This can lead to discomfort and apathy, which are likely amplified if a young person is mentally unwell. Engagement should actively and collaboratively seek solutions, rather than only focus on problems. Activities must be based on relatable examples (Pedersen and Buur 2000, Mazzone, Read, and Beale 2008). Co-creative methods are not traditionally employed with this user group. Therefore, our approach was very much experimental and adaptive.

## Workshop activities

Following ongoing consultations with mental health experts and patient advocacy representatives, a series of co-design workshops was conducted. A diverse range of

young people experiencing psychosis, their families/carers, and clinical staff in hospital and community mental health settings participated. We aimed to explore information preferences to generate solutions for the design (content and look-and-feel) of a new resource.

During Discovery workshops, involving a total of 13 participants, our challenge was to engage participants to share their experiences of psychosis, allowing us to develop an intimate understanding of their needs, concerns, and barriers to treatment and management. Our methods needed to be fun, engaging and related to the types of interactions and experiences familiar to young people. Each method acted as an entry point into exploring topics that would inform the design solution content.

In our first workshop icebreaker, we developed an activity based around co-designing a pizza. This served to demonstrate how we would continue to work collaboratively. To get a glimpse into participants' everyday interests and preferences, and inspired by young people's extensive use of social media metaphors, we developed a simple storytelling exercise using emojis (Figure 1). This activity enabled participants to contribute and share without needing to vocalise their experiences and eased the group into mapping out areas of interest for the design work.
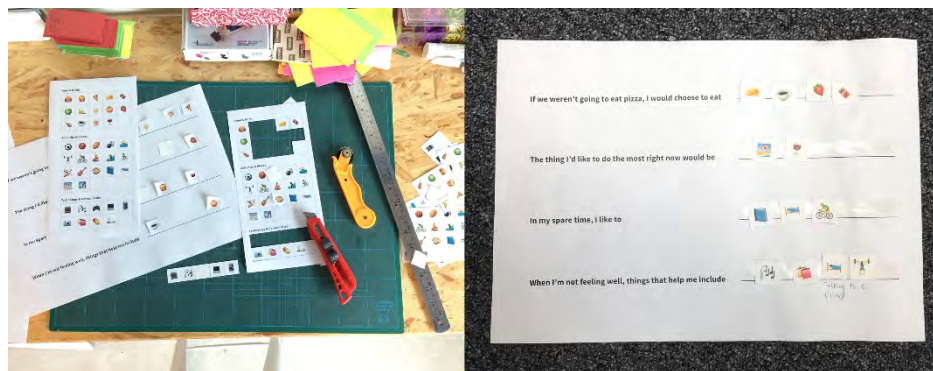


Figure 1. Emoji story activity with an example of an emoji story completed by a workshop participant.

To hear a first-hand account of people's experiences, we presented a relatable persona- a young fictional character, 'Jack' recently diagnosed with psychosis. Participants were asked 'What's it like for Jack?', 'What might he be thinking/feeling/saying/doing at that moment?', 'What might he like to know? (Figure 2).

**Figure 2. A relatable persona with emotion mapping.**

This was highly effective and valuable. By allowing participants to project their thoughts, feelings and experiences onto a fictional character, any sense of direct attention or pressure to a specific individual was dramatically reduced.

We used a more straightforward brainstorming activity to generate resource ideas (i.e., who and how it will be used, what information, features, functionalities were needed, how it might look and feel) (Figure 3).



**Figure 3. Outputs from the ideas for online resource brainstorming activity.**

To determine the most meaningful types of content we used a card sorting exercise. This required participants to arrange high-level topics previously identified as essential by healthcare professionals and user advocacy representatives. Participants could add additional topics to include in the card sort (Figure 4).
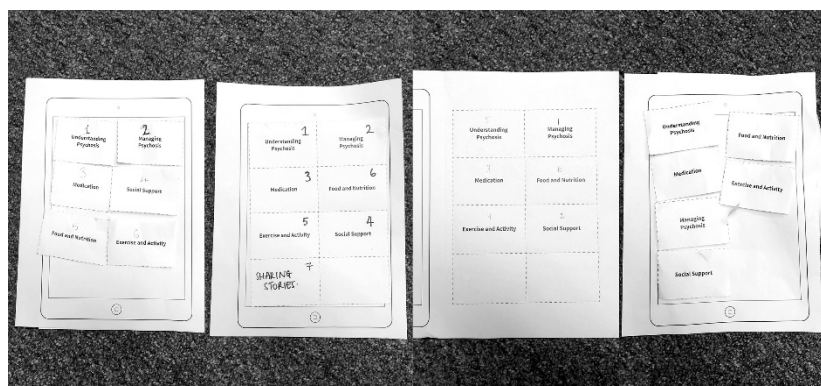


**Figure 4. Examples of completed card sorts for high-level information topics.**

The findings of activities in the Discovery workshops informed the first iteration of the design solution. For example, the users wanted a website, not an app, that would be a one-stop shop for patients and their families to learn more about psychosis and how best to manage it. It needed to use simple, clear language, take a patient's perspective and experience, and allow for self-directed learning for those who want it. Consequently, we created a 'Learn' section on the website with content tailored to these needs. Participants also expressed the need for a personalised area on the website (that we subsequently labelled 'Track') to record medications, side effects, and emotions/feelings, that they could use to facilitate conversations with clinicians. Young service users also expressed a strong need for a space to share experiences with others in a similar situation. Thus, we created the 'Talk' section, that allows individuals to post and read personal stories.

In the Prototyping workshops, a total of 9 participants contributed to broader aspects of the design solution. 'Abstract emotion' sketching was used to portray/visualise what a good and a bad day looked like (Figure 5). These sketches were later used as inspiration for the visual look-and-feel of the resource.
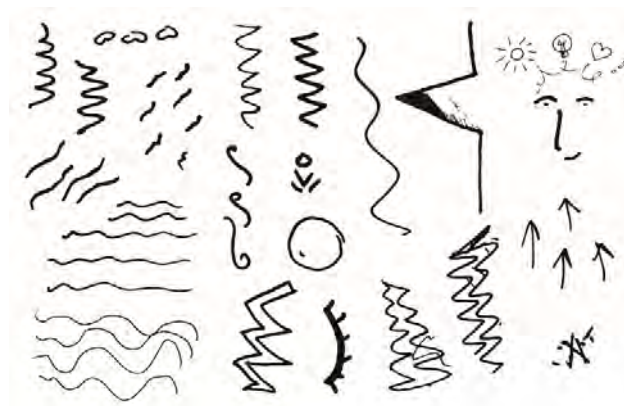


**Figure 5. Some of 'abstract emotion' sketching outputs.**

An emoji rating system was used to provide feedback on digital and paper versions of our proposed solution, with 'comments' on each page to elicit first impressions responses (e.g. clarity of purpose, name, visual presentation, language, and tone of voice) (Figure 6).
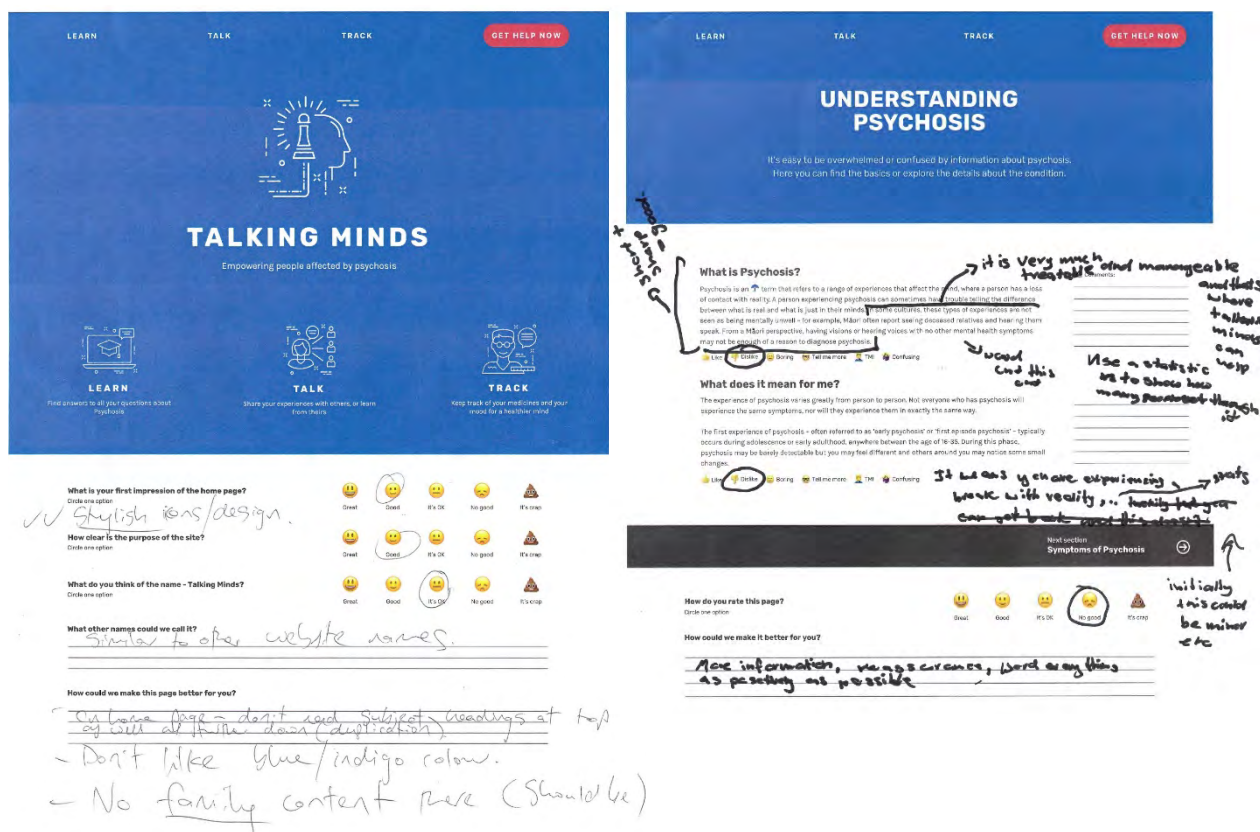


**Figure 6. An example of feedback on digital and paper versions of the proposed solution for the home page and a sample content page for the website.**

Based on user feedback from the Prototyping workshops, the second iteration of the website incorporates visual elements inspired by the participants' sketches, contains 'chunked' text on each page, rather than scrolling, simplified imagery, text labels, and brighter colours. The 'I'm concerned' button is added to the home page containing information on non-urgent support services (Figure 7). Our next step will be to test this iteration of the website with young service users.
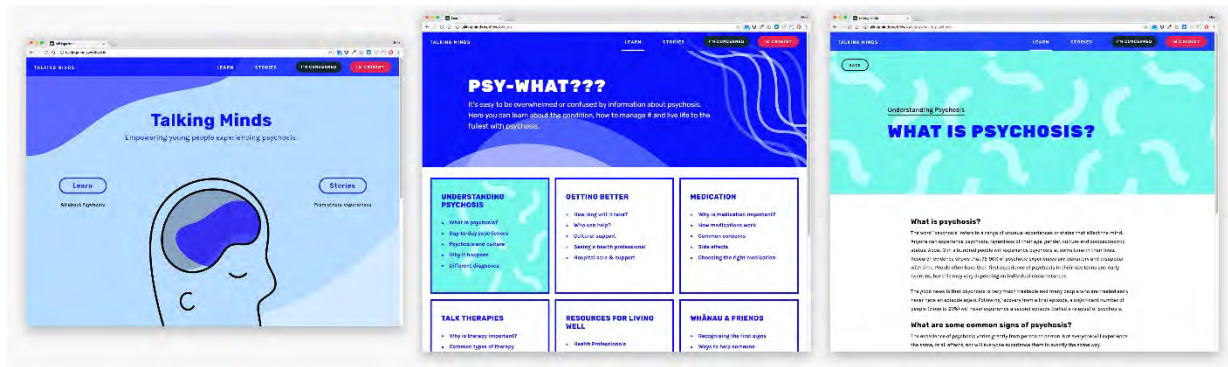
**Figure 7. Some of the pages in the latest iteration of the website.**

## Discussion

Designing with people faced with serious mental health challenges, where the focus is on solutions rather than problems is not common practice. This is despite patient and public participation recognised as part of best practice in health research (Wolstenholme, Grindell, and Dearden 2017). This paper demonstrates that young people experiencing psychosis can be meaningfully engaged in the co-design process using simple, creative participatory methods. During workshops, young people gradually opened up to the various activities and became willing to share their more intimate concerns, feelings, and challenges.

Our experience validates recommendations around working with young people with health conditions (Sustar et al. 2013, Välimäki et al. 2008, Bowen et al. 2013). Mainly, it is important to consider young people as equal partners. Solutions should focus on what best suits user needs. Considering youth as experts in their experiences values their ideas, and incorporating their ideas into concepts validates their input. Finally, flexible and adaptive creative activities help to maintain their interest, engagement and motivation.

Having open-minded clinician and research partners was critical to the success of the co-design process. These individuals were willing to break free from traditional, more passive research methodologies, embrace innovation and let the future users drive and shape the design of the resource.

We received positive feedback on our engagement approach from both workshop participants and clinician stakeholders. Our approach was considered 'different', innovative, and novel in the context of mental health care. Of all activities, we found prototype evaluation most challenging, as it led to multiple discussions being held at the same time. We recommend replacing written feedback with breaking participants into smaller discussion groups who would share their ideas at the end of the activity.

Participants attended workshops in their free time. While we did provide small material, extrinsic motivators (e.g. refreshments), motivation appeared intrinsic: being endorsed as experts in their condition, sharing their stories, expressing their needs, and working cooperatively to shape a resource to benefit themselves and others in a similar situation

(Bowen et al. 2013). Repeated attendance, even from those less mobile due to a physical disability or being less vocal than others, supported this.

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# Responsive tangible rewards in physical activity gamification

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## Keywords

computer-aided design, human-computer interaction, obesity, persuasive technologies

## Introduction

The World Health Organisation (WHO) 2014 census estimated that 1.9 billion adults aged over eighteen years old were overweight, with 600 million obese (WHO 2016). The impact of related health issues creates a significant challenge for society in terms of both quality of life and costs. Regular physical activity has long been identified as a key factor in weight management strategies.

Human-Computer Interaction (HCI) research has engaged with this problem on a number of fronts, for example, Johnsen et. al (2014) explored mixed reality as a tool to help reduce childhood obesity, while mainstream game console manufacturers Xbox (Kinect for Xbox 360 and Xbox ONE) and Nintendo (Wii) have popularised physical gaming in order to get players more active. The research here focuses on HCI technologies that "persuade by giving a variety of social cues that elicit social responses from their human users" (Fogg 2002, 89), known as persuasive technologies. The tools have typically been mobile devices and wearable activity trackers, for example Fitbit (wrist-worn) and Nike+ (shoe-worn). These systems use quantified methods to display numerical data to the user, or employ gamified methods with the assumption that by applying game design principles to physical activity, the activities will become more enjoyable and engaging (Zuckerman and Gal-Oz 2014). Many systems employ a blend of methods, allowing users to see detailed numerical data, whilst simultaneously offering game elements such as leader-boards, virtual rewards, points, levels or challenges.

Research into the effectiveness of gamification to improve physical activity is inconclusive however, with studies conducted within health and other fields, providing mixed results. Zuckerman and Gal-Oz (2014) provide a thorough analysis of peer-reviewed studies into gamification, concluding that "due to contradicting findings from prior studies, and lack of systematic research in the field, [the assumption that gamification increases the motivation to perform physical exercise] cannot be supported by the existing literature." A similarly broad review of the literature on gamification by Hamari, Koivisto and Sarsa (2014) resulted in a more positive view of gamification, however "the effects are greatly dependent on the context in which the gamification is being implemented, as well as on the users using it." With the effects of current gamification strategies unclear, there is scope for exploring alternative methods

of gamification linked to interactive design that could potentially push the field in new directions that may prove more effective.

## Evolving responsive systems

One of the limitations to most current gamified systems for physical activity is that the rewards are intangible, often taking the form of digital badges or virtual achievements which only exist within the software or application being used to record activity. The Zuckerman and Gal Oz (2014) study identified mixed results from systems with such ephemeral rewards, while Scott Nicholson (2012) suggests customisation of goals and rewards as critical to the success of gamified systems. The same link between customisation and enhanced customer engagement can be seen in product design with the rise in additive manufacturing (3D printing) which allows for the cost-effective production of objects which can be personalised to "provide more comfort, unique aesthetic appeal, or better performance" (Shugrina, Shamir, and Matusik 2015) than generic mass-manufactured products.

## Example 1: responsive CAD

In this example, six consecutive months of step data was collected using a Garmin Vivofit wrist-worn activity tracker. The raw data from the device showing step goals for each month, along with the actual steps recorded is displayed in table 1, and represents the standard quantified method for understanding and reflecting upon personal physical achievements.

**Table 1. Step data collected using a Garmin Vivofit activity tracker 2014–2015**

| Month | Actual Steps | Step Goal | Percentage of Goal |
|---|---|---|---|
| December | 60861 | 38512 | 158% |
| January | 297177 | 240231 | 124% |
| February | 233489 | 241369 | 97% |
| March | 288045 | 254339 | 113% |
| April | 213238 | 252465 | 84% |
| May | 53391 | 65021 | 82% |

However, working with algorithms and parametric Computer-Aided Design (CAD) systems, it is possible to create three-dimensional computer models that are parametrically determined by this data. In this approach, the quantified data is represented in a more visual way. A story can then become an important element of "game-play," for example the goal becomes about helping the caterpillar grow and metamorphose into a butterfly rather than accumulating meaningless points. Figure 1 shows the visual representation of the data from table 1, and uses the percentage of

goal achieved to automatically generate the 3D models; the caterpillar represents the amount of achievement below the goal, with each body module representing 10%. The butterfly emerges once the monthly step goal is achieved (100%), and scales in size based upon the percentage over 100%. By using percentages rather than the actual steps, this system allows for the goals to fluctuate, for example an increase in monthly steps to improve fitness which is a feature within the Garmin software, without affecting this experimental system. The 3D models can also become tangible rewards through 3D printing, as shown in figure 2. This opens up gamification to a whole new way of thinking about motivation that could have significant implications for design for health.
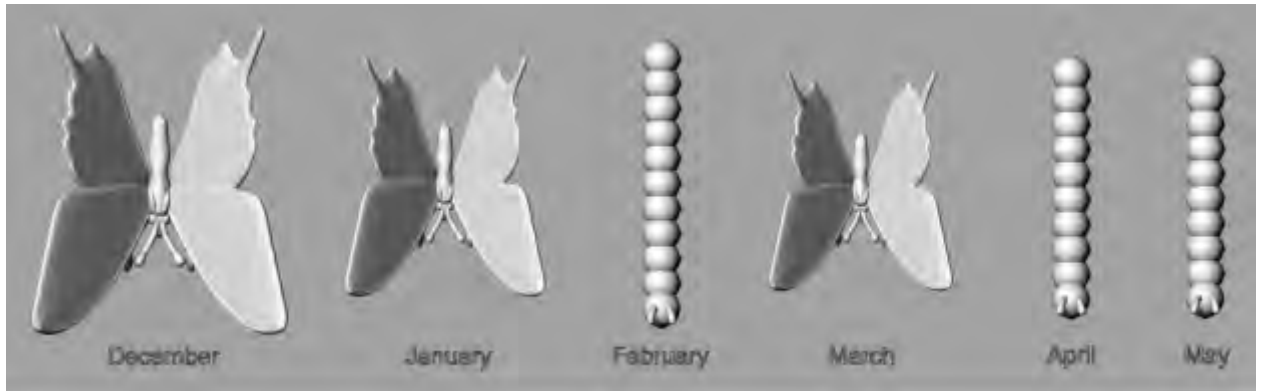


**Figure 1. 3D parametric models determined by Garmin Vivofit data representing the percentage of goal from table 1**



**Figure 2. 3D prints of the results for March and April**

# Conclusion

Persuasive technologies are in their infancy, and whilst initial enthusiasm for standard interaction devices designed for gamifying exercise was high, more sophisticated responses to the challenges of motivating and engaging users are needed. The conference presentation will show a series of concepts by the design-led researcher James Novak into the gamification of physical activity, offering a new research direction whereby users are better able to customise their experience and develop more meaningful engagement in both the digital and physical worlds.

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# Design across the Spectrum: Enhancing inclusion for children on the autism spectrum in the playground

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## Keywords

Autism, Playgrounds, Inclusive Design, Guidelines

## Introduction

Inclusive education is a core tenet of the UN Convention on the Rights of Persons with Disabilities, supporting an emphasis on equitable access to education in mainstream settings (UN General Assembly 2007). This requires the integration of a variety of specialised supports as well as the transformation of culture and practices across the entire school. For children on the autism spectrum, the idiosyncratic needs of each child present particular challenges. In Australia, 86% of children with autism reported difficulties in attending school, including problems with learning, communication and social integration (ABS 2012).

Break time has been identified as one of the most challenging situations for children on the autism spectrum, due to sensory and cognitive differences and the emphasis on social interaction and unstructured play (Couper, Sutherland and van Bysterveldt 2013). There is also substantial evidence highlighting the importance of the design of the built environment for individuals on the autism spectrum (Gaudion and McGinley 2012; Khare and Mullick 2009; Nagib and Williams 2017). A number of studies have explored the design of formal learning environments within schools (Mostafa 2014; Scott 2009; Vogel 2008; Whitehurst 2006). However, the aim of this project is to develop targeted design strategies and solutions for the playground to improve access, inclusion and wellbeing for children on the autism spectrum.

## Background and methods

The study originated as a design research project involving Master of Architecture students with the dual aim of developing design guidelines and a schematic design for a local primary school.

The guidelines were formulated in relation to relevant literature, including an assessment of precedents in educational settings. The guidelines and the design project were also informed by a stakeholder reference group comprising the principal, a special education teacher at the school and an autism consultant within the Department of Education. Additionally, the school invited teachers, parents and students to review and comment on the design. The project was framed and presented to the broader school community as an inclusive design initiative, supporting the diverse needs and preferences of the entire student body, rather than a specialised facility for students on the autism spectrum.

The project has now been constructed and a post-occupancy evaluation will be conducted in late 2017 or early 2018 following approval from the human research ethics committee.

## Design outcomes

The guidelines are structured as a series of eight inter-related patterns as illustrated in Figure 1.
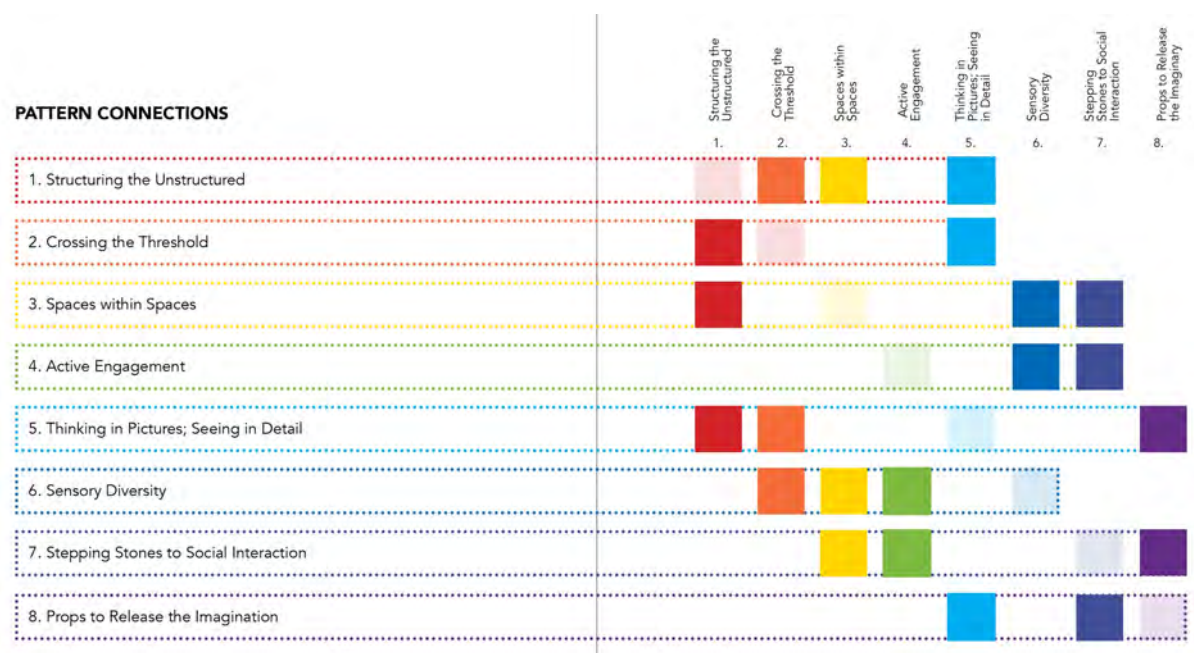


**Figure 1. Patterns and connections**

*Structuring the Unstructured* focuses on the organisation of space and time to enhance predictability and reduce visual distraction. *Crossing the Threshold* addresses the difficulties children on the autism spectrum can experience in transitioning between activities and spaces through creating gradual transitions with clear boundaries and spaces to pause and preview what comes next. *Spaces within Spaces* emphasises the need for spatial diversity and containment as well as the provision of places of retreat. *Active Engagement* responds to the movement preferences of children on the autism spectrum including spinning, swinging, bouncing and repetitive movements, as well as consideration of the diversity of motor skills. *Thinking in Pictures/Seeing in Detail* capitalises on the visual strengths of children on the autism spectrum by employing visual cues as well as clarity and consistency in signage to enhance communication. *Sensory Diversity* recognises the diverse sensory profile of children on the autism spectrum through a neutral and calming palette with localised sensory stimulation. *Stepping Stones to Social Interaction* enhances opportunities for social interaction in carefully structured social settings as well as acknowledging the importance of, and need for, alone time through the demarcation of personal territory. The last pattern, *Props to Release the Imagination*, augments opportunities for imaginative play through the provision of visual prompts, and supports preferences and skills for more structured play by incorporating games with patterns and rules.

The design intervention in the primary school comprised a large verandah and associated play elements called 'Home Base' (Figure 2).



**Figure 2. Home Base**

The verandah mediates the relationship between the grade three classrooms and the adjacent playing fields through an outdoor 'room' that offers a degree of spatial containment and tempers the climatic environment. The space is divided into a series of zones, defined by over-sized columns, ground surfaces of concrete (walkways) and artificial turf (play zones), and plywood box elements. The plywood boxes are stained in black and white to form a soft monochromatic palette. The large columns and roof beams are also clad in plywood, stained on one side with a muted colour spectrum from red to blue and on the other from black to white. Two plywood boxes with peepholes at the end of the verandah overlooking the playing fields offer additional visual and spatial containment. Another plywood box element creates micro-territories supporting parallel play whilst protecting personal space, and a tunnel to a mini cul-de-sac offers a degree of visual and acoustic retreat. Checkerboards routed into the top surface of the plywood create opportunities for structured social interaction through rule-based games. The importance of alone time is recognised through individually coloured tree stumps distributed around the playground. These are identified as 'my spots' and form a counterpoint to the existing colourfully knitted 'friendship tree' at the centre of the school. A future planned play circuit, formed by a series of in-ground elements, supports opportunities for active play and repetitive movements with clear visual cues (Figure 3).

**Figure 3. Play circuit (not constructed)**

# Conclusion

This project contributes to the emerging area of autism and design research through the development of targeted approaches for the design of playspaces. The co-development of the guidelines with a real project has enabled the testing of the discrete strategies within a synthesised design project. The post-occupancy evaluation will provide further evidence to substantiate the efficacy of the guidelines. While the individual project is limited in scope, the design guidelines have been collated in a booklet designed for a general audience with the goal of broad dissemination and implementation in a wide variety of contexts.

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# Increasing confidence through competence in people with dementia through meaningful conversations

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## Keywords

reminiscence theory; dementia care; older adults; smartwatch; proximity beacons.

## Introduction

We introduce *Memento*, a locative smartwatch application for caregivers practicing spontaneous reminiscence therapy with people who have dementia (Bank, 2015). The *Memento* system makes it possible to make meaningful conversations part of a caregiver's everyday interactions with their clients, making residents feel more confident and competent.

With an ageing world population, we will see an increase in age-related health problems such as dementia, making it a concern for communities, governments and aged care facilities (Dahl & Holbo, 2012). While dementia heavily affects short-term memory, parts of long-term memory often stay intact. In particular, there are usually vast amounts of intact childhood and early adulthood memories (Woods et al., 2005), that constitute a vital part of the competences of any person.

Reminiscence therapy has been shown to improve cognitive functioning and general well-being of people with dementia (Woods et al.). It uses recall of memories of events and experiences from people's past which are triggered by visual and audio aids and personal mementos. Reminiscence therapy, usually conducted in a clinical setting, could ideally be part of everyday conversations that happen in the care home. One problem is however, that caregivers in aged care facilities have multiple people in their care and can have difficulty remembering specific memory triggers for each individual. Through the use of interactive and location-aware technologies, *Memento* matches nearby reminiscence "triggers" in the environment (personal and shared artefacts) to residents. Once identified, triggers to stories are subtly displayed on the caregiver's smartwatch, and can be used to enrich in-situ conversations with clients.

## Method

*Memento* was developed in collaboration with a 53 apartment Danish Aged Care Centre in Denmark, where approximately 80 % of residents suffer from dementia in different stages.

We started this study by visiting the care centre and building rapport with the residents, to be sensitive to the fact that this is their home (Waycott et al., 2015). We then held a set of semi structured interviews with the care centre manager, a qualified nurse, an occupational therapist, three caregivers, and the person responsible for maintaining technology at the centre. Next, we observed a caregiver during her entire workday. We then held co-design workshops with the stakeholders to iteratively determine requirements and refine the *Memento* system design.

*Memento* was studied in use, in the care centre, by a single researcher collecting data through observation of a caregiver during their usual activities and interactions with a specific resident, Ester (female, 83), with early stage 2 dementia. This minimized our impact on the residents and routines of the care home. There were 10 trigger items (2 paintings, a journal, a badminton racket, a pot of herbs, a porcelain doll, a cat photo, windows looking onto the carpark, garden, and a sportsground) tagged as important to Ester. The researcher made notes and 20 minutes of Ester's responses were discretely videoed. After the study, we interviewed the caregiver and the care home manager.

## System Design

Memento is a three-component tool consisting of a smartphone, a smartwatch, and small transmitters (proximity beacons) identifying residents and triggers. The smartphone continuously scans for nearby residents and triggers, using a matching algorithm and keyword search on residents documented life stories to make connections. If a resident is nearby, their details are presented on the caregiver's smartphone and a trigger hint is pushed their smartwatch (Fig 1).

**Figure 1. Extracting life story data based on nearby triggers and residents.**

*Memento* stands out from previously proposed solutions by providing in-situ information hints from a resident's life story linked to nearby physical triggers, helping the caregiver to start casual conversations on a topic dear to the resident. The use of a smartwatch as a delivery platform, means that only the caregiver is aware of the technology support, is always in control of the information hints provided, and can glance at the watch without the resident being aware. This improves caregivers' abilities to engage in spontaneous reminiscence therapy during every day routines. As an example, during the study, using a nearby herb garden, the caregiver was able to start a conversation with Ester about her garden on the farm where she grew up.

## Results

The caregiver received numerous triggers on her smartwatch during the study, and was able to use them without difficulty. Every time a life story trigger was used, it proved relevant in activating memories that prompted Ester to engage in conversations she cared about, without reducing the companionship between the caregiver and Ester. Additionally, the Care Home Manager saw *Memento* as a useful shared repository for collating residents' life stories, as they learned more about their clients.

## Discussion

Using a system like *Memento* makes it possible for caregivers to help augment the residents sense of self through small episodes and conversations that interweave with

their everyday lives. Additionally, finding common interests among residents and placing general triggers in common areas could facilitate spontaneous reminiscence conversations in groups. The subtle nature of interaction with the smartwatch, and barely visible proximity beacons means that interactions between caregivers and residents maintain a feeling of companionship and presence. As the caregiver said, "What matters most [...] is the preservation of identity. [With this system] we get an electronic tool that helps us [...] focus on the person all the time."

## Conclusion

Structuring life story information in a way where small snippets or hints can be matched to triggers in the resident's proximate environment opens up new opportunities for spontaneous reminiscence therapy. Through this study, we contribute to technology design for health by reconfiguring small, available everyday technologies to achieve positive health outcomes, as well as new ideas about delivering health interventions as part of peoples' daily activities.

## Limitations and Implications of Study

To date, we have only conducted one case study of a single resident in a care home. Since we have, however, developed a robust technology that is ready for deployment, we would like to study the system in use longitudinally, with data logging, in a variety of care homes, involving more caregivers and residents, with many tagged artefacts and places.

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# Interactive technologies helping young adults manage low self-esteem

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## Keywords

self-esteem; digital engagement; technology probes; design workshop; internet of things

## Introduction

This research explores how interactive technologies can be designed to help young adults manage low self-esteem. Low self-esteem is an important issue because it can have a dramatic effect on a person's physical and psychological health (Campbell & Lavallee, 1993; Delongis et al, 1988). Severe self-esteem problems can make simple everyday tasks, like getting out of bed, seem too difficult. If low self-esteem goes untreated, it can lead to the development of conditions such as suicidal thoughts, eating disorders, substance abuse and depression (Elmer, 2001; Harter, 1993; Oshri et al., 2017; Sowislo & Orth, 2013). Young adults in particular experience a decrease in personal self-esteem during the transition from childhood to adulthood (Oshri et al.). While these changes are slow, young people can experience short-term fluctuations in their immediate feelings of self-worth (Rosenberg, 1986). Treatment of severe self-esteem problems requires seeking professional help, however the stigma attached to this deters young people from doing so (Corrigan, 2004).

Technologies can obviate this problem to some extent, by offering ways to provide health support privately and flexibly, making this kind of intervention more attractive. Technology can also tailor solutions to suit individuals, for use in their familiar environments.

## Method

This exploration began with a co-design workshop involving 8 young adults with low self-esteem (5 males, 3 females, aged 19-24). To help facilitate ideation and envisionment of technology solutions, we used an innovative process called "The Creative Platform" (Hansen & Byrge, 2009). Outcomes from the workshop included 20 sketched ideas, refined into 8 mockups. Guided by our Self-Esteem Toolbox (Larsen & Nielsen, 2016), we refined the mockups into two interactive artefacts. These artefacts were then deployed in 6 of the participant's homes for 2 weeks each, as technology probes (Hutchinson et al., 2003). Our aim was to understand how different aspects of these interactive technologies might be useful in helping manage low self-esteem.

# Technology Probe

The two probes were*: The Sun of Fortune* (Figure 1a) and *The Happy Frog* (Figure 1b).
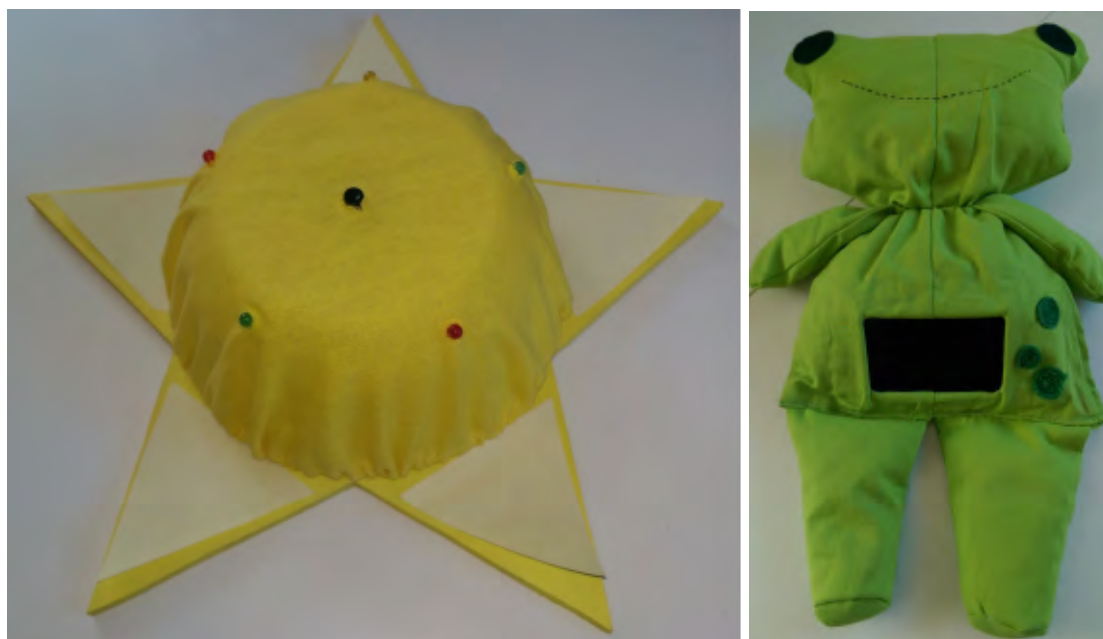


**Figure 1: The technology probes deployed in participants' homes':**
**a) The Sun of Fortune, b) The Happy Frog.**

The Sun of Fortune invited participants to write activities on each of 5 petals. They were asked to choose activities that made them feel good or distract them from negative thoughts. When they felt low, they could press the Sun's button, and it would select an activity for them. The Sun uses a BBC Micro:bit, an edge connector, a battery pack and 5 LEDs. The petals have post-it notes for easy removal and replacement of activities.

The Happy Frog was designed for participants to lift up when they felt low, making it say an encouraging or motivating comment. These comments were created by participants through a connected web site. They could give feedback using the frog's screen, to indicate how happy the comment made them feel. The Frog uses a Samsung Galaxy S3 mini smartphone to register lifting, and trigger talking.

During deployment, participants were asked to keep a dairy of their experiences and take photos of each probe location, with a box of additional post-its for the Sun, and a login for the comments website for the Frog. Interviews were conducted at the start, midway, and at the end of the 2 weeks with each probe.

# Results

In general, each participant had a positive reaction to at least one of the probes, and could imagine using it in the future. A total of 73 post-its were created for the Sun and 38 comments for the Frog. The frog was lifted 217 times, and rated every time (49 positive, 168 neutral). Participants had a difficult time placing the Sun in their homes, its large size being a problem. The placement of the Frog was limited by needing to be charged most of the time.

All participants reported that at least one of the probes offered a concrete and private way to work with bad feelings. Interestingly, most participants reported a preference for whichever probe they experienced first.

## Discussion

We noticed that participants worked through their negative thoughts in highly individual ways. This was evidenced by the different ways and times that they chose to use them. The Sun had a short-term effect on participant's negative thoughts, they were temporarily distracted from them but did not necessarily gain improved self-esteem. They also reported that the Sun's activities did not always fit the times they felt bad, so could not always help them. For example, "catch up with friends" was not appropriate when using it late at night. The Frog more directly helped manage low self-esteem, creating immediate positive feelings and giving an opportunity to reflect on this. However, participants reported that writing compliments to themselves made them feel uncomfortable, and would prefer compliments written by others.

Overall, the Frog was deemed most effective because it only took a short time to use, and could easily fit into everyday routines. It would make them smile or instantly feel more positive about themselves. However, the Sun was reported as "allowing" participants to treat themselves, and they enjoyed the freedom of writing their favorite things to do on the post-its. They liked that it was making the choice for them. Both probes were easily and enthusiastically integrated into their homes and daily lives.

## Conclusion

In understanding how technology can be used to support young people in managing low self-esteem, we offer empirical evidence of positive responses to our probes, as well as participant thoughts on how such technologies might help them manage self-esteem problems in the future. The success of both designs can be attributed to being based on mockups created in a co-design workshop, being designed using research on self-esteem influencers (The Self-Esteem Toolbox); and providing the flexibility for participants to use them in different ways and personalize them to fit their individual needs.

## Limitations

Our study is limited by the short deployment time (2 weeks) for each probe, a longer period would give more validity to the results. Also, although we aimed to be sensitive in our approach, we cannot be sure that we were able to break through the barriers that make it hard for young people to honestly and openly talk about their self-esteem problems.

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# The SEE toolkit: How young adults manage low self-esteem using personal technologies

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## Keywords

Self-Esteem; Personal Technologies; Young Adults; Cultural Probes.

## Introduction

While low self-esteem is treatable, there is a stigma attached to seeking treatment for it (Corrigan, 2004). Low self-esteem can make even small things, like getting out of bed, difficult and lead to more serious illnesses such as depression or eating disorders (Elmer, 2001; Harter, 1993; Oshri et al., 2017; Sowislo & Orth, 2013). To understand how young adults are currently managing their self-esteem, we conducted a study using cultural probes (Gaver et al., 1999) and interviews with 11 young adults who feel they have low self-esteem. We identify the ways in which these young people act to increase their sense of self-worth, with particular focus on how they use personal technologies, such as smartphones. The aim of the study was to understand the role that these technologies were currently playing in the lives of people with self-esteem problems, and to investigate how personal technologies might be designed specifically to help people cope with low self-esteem, and ultimately improve their self-worth. Our contribution to health informatics is the SEE (Self-estEEm) toolkit, which identifies important factors that can influence young adults when dealing with low self-esteem. The SEE toolkit can be used in the design of health support technologies for young adults who want to manage their own self-esteem The SEE toolkit can be used in the design of health support technologies for young adults who want to manage their own self-esteem problems, giving them a private, helpful and meaningful user experience.

## Method

Conducting research within the area of self-esteem with young adults requires sensitivity, as sufferers often have difficulty talking about it (Corrigan, 2004). We used Cultural Probes (Gaver et al., 1999), as a research method that prioritizes participant's well-being and control over information being gathering and has proven effective for researching sensitive situations (Kjeldksov et al., 2004; Waycott et al., 2015). The cultural probe packs provided a collection of recording materials, activities and provocations that participants were invited to interact with (see Figure 1). Designed to be used within a participant's private domain they were helpful in evoking our 11 participants (5 males, 6 females, aged 16-23) to reflect, interpret and express themselves about their perceived low self-esteem and how they are dealing with it. A 6-week deployment of the probe pack, started with an interview and introduction to the

probes and was followed up with a second interview around one week later to check their progress and provide encouragement. Interviews were then held at two week intervals, giving participants time to reflect upon and interpret their use of the cultural probes. Each interview started with an informal conversation with researchers sharing their own experiences to help participants relax. A total of four individual interviews were held with each participant. After collecting the probe packs, we held a focus group with 8 participants who consented to further explore their insights in a group conversation.



**Figure 1. The Cultural Probe Pack including: a diary, a scrapbook, a drawing pad, a pair of scissors, stickers, clipart-pictures, glue, colouring pens, a pencil, a fine liner, tape, a smiley-calendar, post-its and a variety of fill-out-the-blanks assignments.**

## Results

Analysis of probe data is complex. The data returned is in different forms, such as prose, drawn images, stickers, photographs, and responses to activities. We used qualitative content analysis (Hseih & Shannon, 2005) to combine probe outcomes with transcripts of the interviews to derive codes and categories across the whole dataset. Using the theory of global and domain specific self-esteem (Killie & Wood, 2012) as an analytical lens, we identified 14 behaviours impacting a person's self-esteem. Some had a positive

impact on self-esteem: reflecting on self, recording personal thoughts, seeing different perspectives, sharing thoughts with others, looking at the bigger picture, asking for advice, doing personal improvement, setting goals, giving self-praise, finding a distraction, and doing what feels good. Others had a negative impact: dwelling on bad thoughts, being self-critical, and isolating oneself. These activities were further refined by revisiting original data to understand the essence of these behaviours, and through affinity diagramming (Beyer & Holtzblatt, 1997), six high level themes emerged. These themes represent strategies (or tools) that people use in managing their self-esteem problems. Revisiting the original data then allowed us to identify the role that current technologies played in enacting these strategies. These are presented as the SEE Toolkit (see Table 1).

## The SEE Toolkit

| Strategies | Technology Support |
|---|---|
| Reflecting on Self | Keep an electronic diary to record thoughts, review self-image on social media |
| Sharing Thoughts | Texting/calling others for advice/to share, communicating with social media, blogging |
| Changing Your Perspective | Texting/calling others, browsing social media and internet |
| Improving Yourself | Online learning, setting goals with personal tracking applications |
| Being Good to Yourself | Recording good personal moments (photos), playing uplifting music or videos you like |
| Finding a Distraction | Social media, streaming services, digital games, calling friends |

Table 1. The SEE toolkit - informing design of personal technologies for supporting low self-esteem

## Discussion

By talking with young people and having them to respond to cultural probe materials, we uncovered the kinds of strategies that our participants use to manage their low self-esteem, and how they use technologies to assist them. Mostly, we found that they each managed their low self-esteem in different ways, both with and without personal technologies. Even though specific apps exist for improving and managing self-esteem, our participants tended toward self-made technology solutions cobbled together using familiar technologies and platforms. At the same time, they reverted to paper based diaries, physical exercise and meeting people face to face when that worked better for them. The diaries provided in the probe pack were surprisingly popular, participants enjoyed reflecting on and recording their personal thoughts in these, and were open to the idea of using a digital diary if available "in their pockets" via their smartphones.

# Conclusion

Low self-esteem can play a role in how we deal with everyday tasks, and lead to more serious illnesses. Some uses of technology have already been developed for improving self-esteem, but many have not been field tested to study the effects that they have on self-esteem. In our study, we identified the role that technology currently plays in supporting the strategies young people use, and offer the SEE toolkit for use in interaction design of future health support technologies for supporting them in managing low self-esteem.

# Limitations

Our study has some limitations. Firstly, most participants were self-diagnosed, three had a clinical diagnosis. Secondly, we cannot be sure that the cultural probes/interview method worked in breaking down the barrier that makes it hard for young adults to honestly and openly talk about their self-esteem. Additionally, the toolkit needs to be validated by design and evaluation of technologies to understand its usefulness in practice.

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# Speculative co-design: a framework for designing medical devices towards enhanced usability, through explorations of experience.

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## Keywords

Medical devices, co-design, speculative design.

## Extended Abstact

Errors with correct use of medical devices are attributable to 70% of medical device-related incidents (Doyle, Gurses, & Pronovost, 2016) and 50-54% of all medical device recalls (Zhang et al. 2003). Making these types of use errors the leading cause of medical device failure (Zhang et al. 2003). These use errors are a common source of frustration for users, and in extreme cases, can lead to injury and death (Zhang et al. 2003). The prevalence, and occasional severity, of these errors, has prompted the recent introduction of a guidance; '*Applying Human Factors and Usability Engineering to Medical Devices'* by the United States Food and Drug Administration (FDA, 2016) — a leading medical device regulatory body.  Through this guidance document, the FDA seeks to support manufacturers to improve the design of medical devices towards the goal of 'minimize[ing] potential use errors and the resulting harm' that they cause (FDA, 2016).

This paper seeks to unpack the approaches to usability laid out within this guidance, and other associated standards and advice—IEC 62366-1:2015 'Application of usability engineering to medical devices' (International Electotechnical Commission, 2007) & 'Ergonomics of human-system interaction' (International Organization for Standardization, 2009) —and demonstrate that the current advice regarding the usability of medical devices is primarily driven by a background of Usability Engineering (UE) and Human Factors Engineering (HFE). This history brings with it an analytical problem-solution focus and, additionally, a focus on risk mitigation as the primary motivator for usability improvement. In contrast to this, within the wider design field, there is an increasing realization of the limits of this problem-solution mind-set. A recognition of approaching 'use' as a component of designing for experience(s). An approach to designing 'products' that acknowledges and seeks to understand the wider, holistic, context of the users, and the subjectivity of their experiences. This comprehensive focus on experience rather than just 'efficient, effective, and satisfactory' (FDA, 2016) use also opens up the possibility of considering the user beyond their role as just input and output node in an interaction. This consideration of the broader context of experience is particularly important with the design of always-on prosthesis including; cochlear implants (the focus of this author's research), hearing aids, glucose monitors, retinal prosthesis, and prosthetic limbs. With these type of

wearable, always-on, prosthesis becoming increasingly common, a recognition of how these devices become embodied within the device recipient's identity, sense of self, and daily life, is an important consideration.

After unpacking current approaches to usability, the paper proposes a framework for designing medical devices towards the goal of increased usability. This framework considers the contribution of contemporary design-led practice to the issue of usability. A contribution that is made through augmenting and enhancing these existing analytical methods with a greater acknowledgment of subjectivity and experience. Here, an exploration of the contemporary design methodological frameworks of co-design and speculative design is offered, translating a combination of these methods to the issue of medical device usability.

Existing approaches to addressing the 'user' within usability guidance are biased towards a view of the user as someone with problems to be solved. Someone with which to test proposed designs in order to validate successful use. These approaches mirror larger discourses within the medical field in general and are situated within a 'medical-model' of illness and disability. Within medicine and disability, the World Health Organization (2011) advocates for a shift towards a 'social-model' of disability, a change that recognizes impairments not as purely problems to be solved, but as functions of how we as a society inadequately accommodate for a diversity of needs. Within the intersection of this frame and design practice, co-design is an area of design research that is explicitly focused on working with people; in order to better understanding, include, and integrate them and their needs into the design process (Sanders & Stappers, 2008). As such, the importance of understanding and giving voice to device recipients within research and development forms the bedrock of this proposed co-design framework. Seeking to work more actively with medical device recipients within earlier stages of research and development. As an approach, co-design —or Experience Based Co-Design (EBCD)—is increasingly gaining traction within design practice for health (Bate & Robert, 2006; Jones, 2013). Although, predominately these co-design methods have primarily focussed on services, information communication technologies, and frontend idea generation.

The relative lack of projects in which co-design has been applied to device development, and device use—rather than services—points to possible limitations in being able to implement co-design methodologies with devices. Additionally, co-design is limited in its ability to valuable contribute in later stage work around determining use and interaction. Through this framework, I propose that the nuanced and embodied nature of interactions, grounded within the physicality of device use, are best explored through enacting use. Use that can be enacted with users through iterative rounds of prototypes. Moreover, there is an importance for the designer to contribute — and communicate— their subjective understandings of technologies under development, through prototypes, to users. Allowing the designer is to visualize ideas from the 'technology push' and 'market pull' of the medical device manufacturer and provoke debate among users, in response to these ideas. In turn, integrating the 'contextual push' of the user back into the research and development of the devices (Sanders & Stappers, 2012). These are not didactic determinations of the future, to be tested by users, but rather rich articulations of how the future could be, to be explored with users. Additionally,

this process recognizes the designer role as an expert in the design process, and an active participant in the collaboration. Through this process, embracing an oscillation between divergent collaboration in the participatory mindset, and the convergent action of the expert mindset. The work of speculative design (Dunne & Raby, 2013) provides examples and frameworks for creating these rich, tangible, articulations of futures by designers, oriented towards the provocation of ongoing debate.

The tools of speculative design probes are explored here. Proposing that an integration of iteratively evolving probes—within a larger recipient co-design framework—will allow for a greater focus on understanding and designing for use and experience, within the context of medical device research and development. A usability improvement that will be achieved, not through solving 'problems'. But rather, through provoking and encouraging debate within the medical device manufacturers themselves. A debate that is inclusive of users as more active participants in formative research and development. Through this engagement, the designer seeks to co-create preferable futures that merge the input of future device recipients with the designer's subjective understandings of the relevant technology under development. Seeking to create futures that are not only 'preferable' but 'possible', even if they are not currently 'probable' within the momentum of the medical device manufacturer (Dunne & Raby, 2013). This framework does not seek to replace the analytical frameworks — essential to delivering safe and effective devices—but rather to augment them with a greater understanding of use and experience. Ultimately, proposing that a greater understanding of device recipients, and their future needs and desires, will lead to more usable devices.

## Acknowledgements

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# Utilising Lego® Serious Play® to engage children and young people with ADHD and their parents

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## Keywords

User centered, participatory design, technology, ADHD

## Introduction

Attention deficit hyperactivity disorder (ADHD) is a long-term neurodevelopmental condition with three core symptoms; inattention, impulsivity and hyperactivity (Faraone et al. 2005). Children and young people (YP) with ADHD often experience a number of ADHD related difficulties (Powell, Parker, and Harpin 2017b) which often include poor social skills, learning difficulties and disruptive behavior, causing low self-esteem, unsettled relationships and academic failure (Harpin 2005).

YP with ADHD currently over rely on their parents to help manage their ADHD difficulties and receive an ever-decreasing amount of service support as they transition into adulthood. Therefore, it is important to find a way to help them manage their ADHD more independently. YP with ADHD, their parents and clinicians appreciate the potential technology has to help this population manage their condition (Simons et al. 2016). Attempts to use technology include, handheld organisation and self-monitoring devices (Shrieber and Seifert 2009), games (Bul et al. 2016) and iPads (Pinna 2015). However, many of these technologies are unsuitable for this population (Powell, Parker, and Harpin 2017a). Children and YP with ADHD are also not included in the process of developing many of these technologies. It is imperative that the end user's knowledge and opinions are considered when developing such interventions to improve the suitability of technologies (Powell, Joddrell, and Parker 2017).

Therefore, our overall aim is to develop an evidence based and coproduced technological intervention to help children and YP manage their ADHD.

In order to begin exploring this concept we conducted a workshop that adopted a Lego Serious Play (LSP) methodology to engage children and YP with ADHD and their parents in the coproduction process. To our knowledge this is the first LSP workshop to be conducted with this population and with diads (parent and child).

Workshop Aim

The aim of the LSP workshop was to adopt a user centered design and to gain the views of children and YP with ADHD and their parents about what they like about their ADHD, what they find difficult as a result of their ADHD, what they would like to support their

ADHD related difficulties, and how could technology help manage these difficulties? Participant's views expressed during the workshop will begin to inform the co-production process of a new ICT-based intervention for this population.

# Method

## Recruitment

Workshop places were advertised via ADHD clinical support services, ADHD parent groups and existing contacts.

## The workshop

LSP was adopted to help participants communicate and contribute to the development of the intervention. The workshop was led by a certified LSP facilitator. The goal was to encourage creative thinking through team building and using Lego to create models of perspectives and experiences. Lego models were used as metaphor to facilitate discussion.

## Participants

Table 1 presents the age and pseudonyms for each YP with ADHD that attended. All six YP were male. They all attended with their mothers, and one with their grandfather as well. It isn't surprising that all YP were male as gender differences in ADHD clinic populations have been identified with a ratio of 3:1 (male-to-female) (Parker et al. 2016).

Every participant contributed to the workshop by sharing their models and experiences with the group.

**Table 1 Participant pseudonyms and age**

| Pseudonym | Age |
|-----------|-----|
| Jack | 9 |
| Ross | 11 |
| Michael | 10 |
| Laurence | 9 |
| Jake | 12 |
| Sam | 9 |

**Results**

The workshop set out to answer 4 questions:

## 1. What do you like about your ADHD?

Jack said he likes his creativity, Ross liked that he has lots of energy and built a tower with a flag to signify winning a race. Michael likes that he can focus on things that interest him and Laurence says he likes that he is passionate about animals (he built a model of a dog).

## 2. What do you find difficult as a result of your ADHD?

Jack said he struggles to concentrate; he described his anxiety when the teacher gets frustrated with him (he built his teacher and used a red brick to signify their anger). Ross said he struggles to relax and built a model of him in bed not sleeping! Luke built a model of him unable to watch the TV because he was arguing with his siblings, and Jake's model reflected that he hates it when the teacher gives him multiple instructions at once rather than one instruction at a time.

## 3. What would you like to do to overcome these difficulties?

Ross's model represented that he likes to be part of a team; Michael built a boat to get away from his difficulties and said he dislikes surprises and likes predictability. Another child built a model of a dog with a gate; they like to feel safe with boundaries.

## 4. How could technology help manage these difficulties?

They liked to idea of a web-based intervention for YP with ADHD. Parents liked the idea that this tool could be used to educate the YP about their ADHD. Parents agreed that using technology to engage YP with ADHD was a good idea as long as it was interactive, not passive.

## Conclusion

The participants embraced the use of LEGO to facilitate perspectives, thoughts and feelings and discussion. Suggestions of intervention content included; Acknowledging transition periods that YP with ADHD can struggle with e.g. moving to secondary school or adult ADHD services, endorsement from adults with ADHD who have led successful lives, the intervention should be predictable and easy to use, involve lots of interaction and only provide instructions one at a time. Lessons learned from this workshop will contribute to an ICT-based intervention to educate this population about their ADHD and how to manage it. Further work is to be conducted to continue the co production of this intervention.

YH), www.clahrc-yh.nir.ac.uk. The views and opinions expressed are those of the authors, and not necessarily those of the NHS, the NIHR or the Department of Health.

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# Enhancing social connections amongst older residents of a rural town with community mapping and technology

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## Keywords

Ageing, rural communities, technology, community connections, wellbeing.

## Introduction

Technology can make a big difference in helping people feel socially connected, but it rarely addresses the needs of older adults (Pedell, Vetere, Miller, Howard and Sterling 2014). While numerous technology-based interventions have been developed to prevent isolation, and enhance social connection, there is little evidence around how effective these technologies are for older people (Barnett, Reynolds, Gordon, Maeder and Hobbs 2017, 10-11). This is of particular relevance in rural communities where longer geographic distances, combined with mobility issues of older people and fewer public services available can lead to isolation and decrease their access to community life – consequently impacting their overall wellbeing.

Rural areas in Australia are often perceived as serene, rustic, geographically isolated places populated by people who value both self-sufficiency and community spirit. While we recognise that many older people living in rural communities have deeply embedded connections to people and place, we know that relationships amongst community members is complex and that a one-size-fits-all description of social values only serves to generalise or reduce what is a very rich tapestry of interwoven elements.

This study unravels the detail of social connections amongst members of a small rural community in order to better understand which connections are most valuable to a person's sense of wellbeing. We explore possibilities around supporting, enhancing or replicating these connections with technology in order to make a positive difference in the lives of older adults, and to address the gap in the literature around effective technological interventions for older users.

## Study setting

The pilot field study is currently underway in a small community approximately 34 kilometers from Melbourne. This community was chosen due to its close proximity to Melbourne, and its small population (3500 people). We are using the Australian Institute of Health and Welfare Rural, Remote and Metropolitan Areas (RRMA) classification, which defines the selected community as a rural area with an urban centre population of less than 10,000 people (Australian Institute of Health and Welfare 2017).

It is important to note that the research is limited by geography and that the findings from a small case study of one town in rural Victoria cannot be generalised to another population (Kenney 2009, 139; Yin 2009, 15). The small number of participants may further limit generalisability, though we plan to increase the scope of the study once the pilot is complete.

## Stage one: Community interviews

Semi-structured interviews were conducted with community members aged 59 or older. The objective of the interviews was to gather personal stories about connection to people and place, and personal opinions and experiences of technology use. The participants were well-connected community members who were involved in social groups and community activism efforts.

The participants revealed strong positive experiences with social technology. Their use of technology was strongly tied to the community, especially community Facebook pages where they could campaign about local issues. One participant reported that her passion for community issues was the catalyst for her to learn how to use social media because she didn't want to miss out on the conversation, while another participant noted that her online interactions on community Facebook pages often facilitated face-to-face meetings with local people. The participants reported that they would feel lonely and isolated without this technology and recognised that for people who have difficulty leaving their homes, social media is a powerful antidote to loneliness.

While seeing the benefits the participants were also concerned about the way the younger generation interacts with technology where the immediacy of communication is creating an unrealistic desire for instant validation. They were also aware of the rapidly evolving nature of social technology and felt that while the constant learning curve required commitment to ongoing learning, they had the time and interest to do this. They proposed that aged-care providers could be an excellent conduit for introducing social technology to older people, and that informal mentorship in the home or other relaxed social space, rather than attending specific training sessions, would increase accessibility for older people.

## Stage two: Community mapping focus group

Building on information about the strength, frequency and type of social connections that emerged during the stage one interviews, a focus group was conducted which concentrated on mapping. A group of participants aged 59 or older were asked to draw a map of their community and were asked to write down how often they visit the places included on their map. They were also asked if there are places they visit regularly outside of their community, and if there are people they contact regularly by technological means – phone calls or video chats, for example. Using a co-creation approach, all participant maps are compiled into one overarching map that acts as a visual representation of the community fabric. The purpose of the map is to highlight the physical and virtual connections between people and places, ultimately revealing the extent and complexity of the social network both within and beyond the physical boundaries of the community. We plan to present the co-created map to members of

the focus group for their opinions and feedback as we are interested in how they respond to the visualisation and how it might become a vehicle for further discussions on technology supported communities.

# Conclusion

Upon completion of this pilot field study we plan to work closely with the older adult population within this rural community to prototype and test social initiatives that are technology-supported. We expect that the findings of this study will contribute to validation and implementation of a technological tool that will enable older people to maintain good wellbeing and retain an active role in their community through technology-enabled communication. Post-implementation, we are interested in analysing how much the participant's social networks were maintained or changed with tailored technology use.

# Acknowledgements

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# Technology in health and social care: a critical reflection from across two continents

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## Keywords

Technology design, older adults, health care, social care, meta-analysis, international study

## Technology in health and social care

This paper shares research in the context of older people and technology undertaken across two continents (Australia and Europe) with comparable populations. Whilst some differences exist, the research highlights similarities: ways of introducing technologies, factors that influence technology use, and, most importantly, the broader ethical questions that digital technologies used in the context of health and social care pose. Early developments tended to focus on buzzers and pendants to raise alarms in case of falls (De San Miguel & Lewin, 2008; Lorence and Park, 2006). These technologies have gradually been augmented by devices concerned with remote monitoring of physiological data and sensors around the home to offer reassurance to families and carers (Steele et al, 2009; Vergados et al, 2008; Yan et al, 2010).

Given the potential of these technologies to increase autonomy, support communication, and ease care needs, significant investment in such devices have been made. Within the United Kingdom this has taken the form of the Whole Systems Demonstrator Trial to explore the efficacy of telehealth, and in North America this has manifested itself in the National Home Telehealth Programme.

In spite of this global investment, the evidence to date supporting the use of assistive technologies such as telecare and telehealth remains mixed (Bentley et al 2015). Whilst initial results from the UK Whole Demonstrator randomised controlled trial were extremely promising with 45% reduction in mortality rates and 20% reduction in emergency admissions, Steventon et al have emphasised the need for caution (2012). Criticism has highlighted the low uptake of the intervention and poor user acceptance (Gornall, 2012; Sanders et al, 2012). The UK Health Technology Strategy Board has emphasised the need for further research to build an understanding of the factors that prevent end-users from engaging fully in technology-driven health solutions.

The research undertaken by researchers in Australia and the United Kingdom has sought to build understanding of the issues end-users define as being important barriers to engaging in technology within the context of health and social care. By combining and

comparing this data it becomes possible to gain insights across countries to create solutions that are more globally applicable.

The first researcher focuses on the development of socio-technical systems and design solutions for health and wellbeing with emphasis on older adults. Their research seeks to develop services and products for older people ensuring that their emotional and social needs are incorporated into every stage of the development process. The second researcher in UK is part of a trans-disciplinary group for design, health-care and creative practices, developing products, services and interventions that promote dignity and enhance quality of life. The group aims to engage people who are under-represented in telehealth/telecare research by their age, ethnicity or socio-economic status.

## Results of meta-analysis

Comparing data from these two research strands in a qualitative meta-analysis (Hoon, 2013) across *actual studies undertaken by the researchers* (see list of studies in references list) the following themes evolved:

## Meaningfulness and integration into life context

The relevance of the technology was central to whether or not technology was utilised. Older people described how technology needed to operate within the context of their life and to reflect personal values. The following quote reflects the challenges many individuals described:

*"The computer sits in the corner watching what we do but it's not a part of what we do."* (participant aged 72, UK).

## Ease of use

Technologies that were not intuitive to the end-user were problematic. Inability to successfully master a device not only resulted in feelings of frustration but also in individuals questioning their own levels of competence and abilities more generally:

*"When you can't operate it you feel do helpless don't you? I end up being dependent on my son to come around to explain things but he is busy and I seem to spend a lot of my time waiting …"* (participant aged 65+,UK) and *"The green button? The green button is for silly questions –actually I have no idea."* (participant aged 90, Australia).

## Feeling included, part of society and connected

These feelings of loss of confidence could in the extreme be exacerbated to individuals not taking up technologies and consequently feeling they were missing out in some way and be excluded from the world:

*"When you don't have access to technology there is a feeling always that you are on the outside of society that you are missing out in some way"* (participant aged 65+, UK)*.*

This could compound feelings of social isolation. In some instances where health technologies were suggested as an alternative to accessing mainstream services participants spoke of feeling that a form of social contact with their health-care practitioner had been taken away. Indeed, these practitioners did not only monitor health but fulfilled an important social role:

*"I would much rather see a health practitioner than speak to a computer. I look forward to meeting with the nurse or the GP. It's actually one of the few times I see anyone* (participant, aged 70+, UK)*.*

# Shifting the balance of relationships (power/control/autonomy)

A similar picture emerged with relation to alarm technologies, which were meant to reassure family members, but ended up reducing face-to-face visits and social contact with family members. This led to pressure on relationships as older people expressed feelings of not being cared about, or at worse, being patronised. This, in turn, could lead to a shift in the balance of relationships, impacting on individuals' sense of control and autonomy:

*"She always would joke about her cowbell [alarm pendant], and complain about it. "Look at what my kids are making me do," kind of comment. A slight resentfulness about it. And it was kind of an area against her independence"* (carer of participant, aged 92, Australia).

Alternatives to not using the technologies were framed as needing to move to a nursing home. Ironically the argument that technology can increase choice and autonomy could have the opposite effect as participants felt monitored and not able to leave their home. The feelings expressed by individuals and the relationship they had with technology was very much dependent on how and when it was introduced and the level of choice individuals felt they had in relation to it.

# Concluding recommendations

This paper has highlighted main challenges identified across different projects and continents. These points of commonality highlight that bigger consideration of choice, training, how products are introduced, and the meanings that they carry are necessary and products need to be understood within the context of people's lives. Despite some differences in Australia and UK these broader themes emerged from both research teams.

Additionally, current products are telling us of the broader attitudes of society and how older people are perceived. We need to think about applications and scenarios and what they mean to human relationships. It is not enough just to manufacture products in response to perceived problems without taking a much broader view of the complexity of people's lives about how technology changes people's relationships. We suggest that a shift in these perceptions on ageing will also give way to innovative and enabling products in health and social care.

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# Pictorial Language: A bridge to meaningful conversation between grandparent and adolescent grandchildren

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## Keywords

intergenerational communication, Computer Mediated Communication (CMC), visual communication

## Introduction

The relationship between grandparents and adolescent grandchildren (GP-AGC) dyads is not always seen as such a significant one in families (Dunifon and Bajracharya 2012). Attar-Schwartz (2009) argue that although often peripheral, it nevertheless can hold an important role, especially if grandchildren are, for example, living in a single parent family and/or experiencing personal issues. By having time to listen to grandchildren and sharing their life experience, grandparents can often take on the vital roles of confidante and mentor. However, the dynamic of family relationship and also the mobility of family means that opportunities to connect between dyads can be limited (Brown 2003; Attar-Schwartz, Tan, and Buchanan 2009).

Studies have shown that standard modes of communication in these situation (contact via telephone and email) are often limited and challenging for grandparents who spend little time with their grandchildren, especially to be able to initiate engaging conversations with their adolescent grandchildren (Boettcher 2006; Davis et al. 2008). The lack of context in their conversation tends to make telephone contact short and feel remote, while contact via email feels less personal. Hiltz (1994) argues the lack of non-verbal gestures can limit the transfer of communicators' perceptions, standardising social interaction and reducing social context in communication. As a solution to this, some scholars (e.g Derks et al. 2008) have suggested the nonverbal cues in lean CMC has the potential to offer greater emotional content in communications. Thus sets out the direction of this research.

This study described examines the use of Pictorial Language to enhance communication between grandparents and their adolescent grandchildren. These graphics, consisting a range of pictures featuring facial expression and related verbal prompts were shown to have a positive effect on deepening emotional expressions between these groups. This paper describes the development of Pictorial Language in this study using data gathered from an earlier study. Evidence of the importance of grandparent roles as confidante and mentor to be performed over a distance using CMC is presented. In addition, the value of pictorial language in mediated communication is captured.

# Aim and Methods

The aim of this study was to investigate the relevance and the value of the developed pictorial language to maintain connectedness between GP-AGC dyads. Figure 1 shows the full range of the language developed for the project.



**Figure 1: Pictorial Language**

As the requirements for designing webpage for younger generation are less restrictive, it was decided that the attributes of pictorial language should follow the guidelines for designing webpage for older population, as set out by Zaphiris and Ghiawadwala (2005).These include incorporating larger symbols, avoiding animation using high contrast, and avoiding content in monochrome (Zaphiris and Ghiawadwala 2005). Figure 2 presents some sample items in detail.



**Figure 2: Pictorial Language in details**

Using co-design workshop, the content and effectiveness of the pictorial language was evaluated by the same dyads from Study One along with some new participants recruited to substitute for some earlier participants who were unable to attend. In total there were 11 dyads. Five dyads were living in Melbourne, while another six dyads were living in Indonesia. Discussions between participants and researcher in the workshop

were recorded then transcribed. Transcriptions in Bahasa were translated into English, then analysed using content analysis.

## Findings and Discussion

Commenting on the significance of intergenerational conversation, GP mentioned that, although often a short-lived experience, was highly valued by them. For AGC, when asked about the significance of intergenerational conversation, Dian (15 year old granddaughter living in Jakarta) mentioned, "when I don't think I was able to trust my friends anymore and went into hiding and wasn't able to trust anybody at that time … she brought acceptance to my mind as most of the time I' always feel a reject." But, their hope was that the conversation could be richer and more varied, featuring more conversation about their futures and problems related to their friendships. For example, Kiann (13 year old grandson living in Melbourne) explained: "there is nothing about like, what you want to do in the future? or like maybe … what you want me to do when i'm older? what do you expect of me?"

Pictorial Language that highlights communication of care and assurance was generated for the purpose of compensating for the limitations of remote contact. The literature on GP-AGC communication argues that this is normally focussed on more general situations that happens around AGC, such as school, (Attar-Schwartz, Tan, and Buchanan 2009; Attar-Schwartz et al. 2009; Kennedy 1992), it was found in the study that pictorial language on lean CMC had the potential to trigger more conversation about AGC life and to open up a space for more meaningful conversation.

It was found, for example, that the pictorial language could suggest more diverse topics for GPs. Thus, one grandmother participant mentioned: "I've been on my own for so long and I'm so used to being by myself, but sometimes I don't know what to say you know, so that having some sort of something like this would be great." It can also suggest appropriate responses for AGC to respond, and at the same time helps grandparent to be more expressive in saying things such as: "I love you, I miss you." On top of this, communicating with pictorial language regarded as fun, especially by younger adolescent grandchildren. This could be partly because of the novelty of this mode of communication, but also because the expression of emotions elicited made them feel more connected, enhancing their social wellbeing. Thus, the use of the pictorial language appeared to facilitate the expression of emotions that would otherwise have been hard to communicate using words.

## Conclusion

This study found that a set of symbols available such as emoji can be used by dyads to effectively express their feelings. The quick responses that are enabled by the technology were perceived positively by participants, and to intensify feelings in their communication. Using co-design approach, pictorial language serves not only to broaden the content of messages, but also enables to the expression of emotions, especially emotions that are not usually communicated. The relevancy of the content to the GP-AGC situation provided more value to them. It would be valuable now to test

how this pictorial language is actually used in the physical application with lean CMC in the future.

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# The hospital environment through the eyes of adolescents with long-term patient experience. Young people affected by cancer speaking

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## Keywords

Adolescent health care, hospital design, patients' experiences

## Introduction

Adolescence is a period of transition that comes with complex processes like developing identity and independence (Mulhall, Kelly, and Pearce 2004). Adolescents are no longer children, nor are they adults yet, but at the same time they are somewhat of both (Lewis 1996). This makes them flexible, but also vulnerable. When on top of that an adolescent is confronted with a chronic disease or the consequences of an accident, their development is jeopardised. They are separated from the familiar environment and exposed to a hospital environment that is not adjusted to young people. Despite growing research on the effect of the physical environment on the well-being of the patient and the child as a patient, the adolescent is often overlooked.

Therefore, this study aimed to find out how adolescents experience a hospital stay and to what extent that experience is influenced by the physical environment. In addition, we attempted to investigate what an adolescent-friendly hospital environment means from the perspective of the adolescents themselves.

Eventually, this study intended to give adolescents a voice concerning what a hospital environment should be like for them, and thereby inform designers, policy makers, and hospital directions and staff about the fact that a hospital environment dedicated to adolescents asks for different principles than one dedicated to children or adults. In short, the ultimate goal was to draw attention to adolescent-specific hospital environments.

## Research methods

Our study focused on young people who are or have been affected by cancer between the age of 14 and 25. More important than their age, however, was their long-term experience as a patient. Using semi-structured interviews, ten adolescents were (retrospectively) asked about their experiences concerning the spatial aspects of a hospital environment.

With the help of *<omitted for blind review>*, participants were approached through someone they trust, so the choice to participate in this study was fully their own. They

were provided with our contact information and were free to contact us. As a result, the study was not bound to one specific hospital setting.

In order to enhance the quality of the data-analysis, provisional results from the interviews were discussed with professional experts and adjusted afterwards.

# Findings

Our findings suggest that the way young people experience a hospital environment relates to three main themes: support, distraction, and control and autonomy (Figure 1). In what follows, these are developed into some more general ideas, expressing the adolescent patient's specific needs.

In the hospital environment, young people first and foremost seem to be looking for freedom of choice and flexibility. The significance of this aspect immediately shows in two of their most specific needs: privacy and social interaction. However important both are, in hospital they are often incompatible. Combining individual patient rooms with a variety of other rooms for activity and relaxation appears to offer a balance between privacy and social interaction. Given the diversity in this ever-changing group, a variety of rooms that facilitate contact with all kinds of others is recommended.
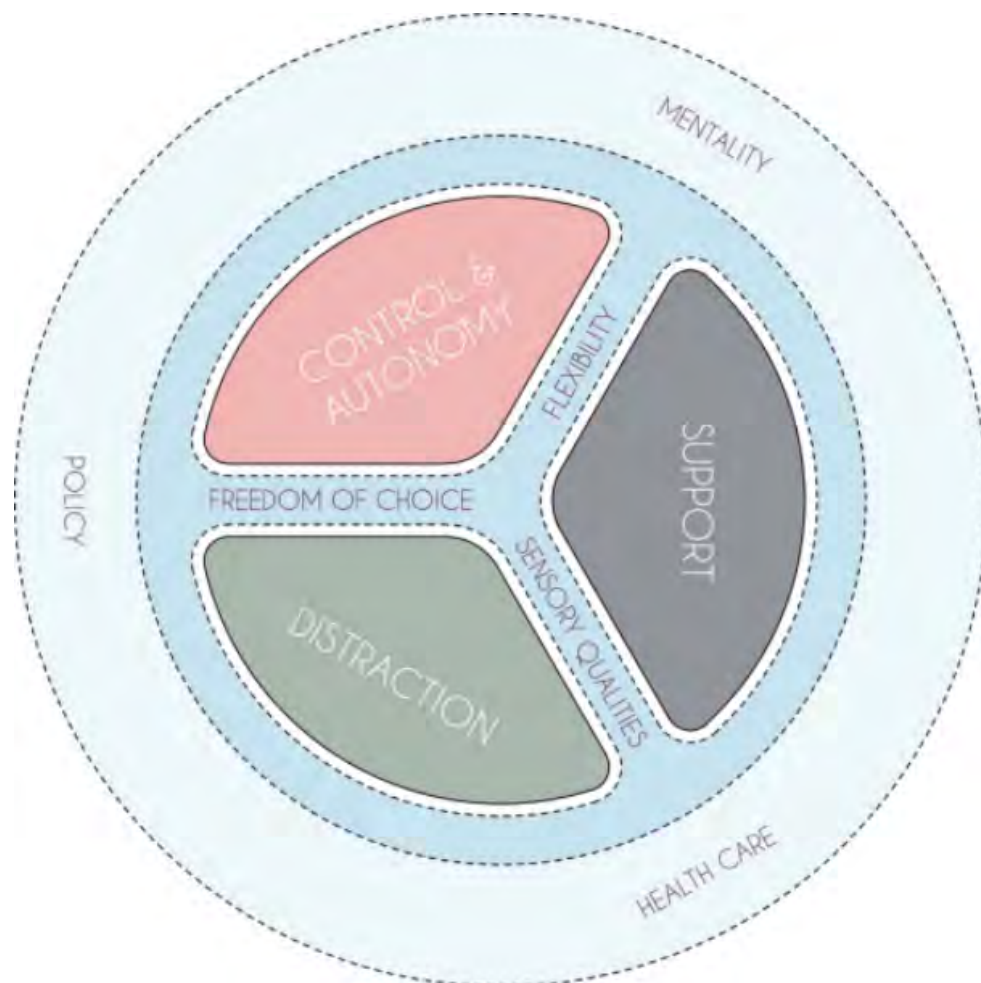


**Figure 1. Make-up for an adolescent-specific hospital environment: the three main themes, connected by the correlation between spatial and policy-related aspects.**

Moreover, this spatial variety simultaneously answers young people's need to move around and prevent boredom. Maybe even more important is the possibility to go outside, for it appears to provide young people with a connection with their 'normal' life. Not only activities can offer distraction, the sensory qualities of the environment may do so as well, with the most important being a view on the world outside the hospital.

Further, for adolescents a supporting hospital environment is a homelike environment that puts them at ease, but where they can also spend time with family and friends in a comfortable way. Young people are in a certain way looking for connections with their life at home, although this might be different for each one of them.

Finally, there is the aspect of autonomy and control over the environment. In the middle of developing independence and identity, adolescent patients suddenly lose control over their own life and body. Flexible visiting hours and freedom of choice concerning eating and drinking turn out to contribute to strengthening a feeling of control and independence.

## Discussion

In a hospital, young people are confronted with different obstacles and most of them appear to be related to difficulties concerning the loss of connection with life outside the hospital. This connection seems to be what adolescent patients are looking for in the first place. The design strategies most likely to contribute to this are (1) maximally designing for freedom of choice, flexibility and spatial variety; (2) paying attention to the comfort of visitors, whether they are family or friends; (3) providing in age-appropriate activities, a nice outdoor space, internet access and other forms of distraction; (4) pursuing aesthetic coherence and a homelike atmosphere; and (5) providing in the combination of individual patient rooms and a variety of social rooms.

The main limitation of this study, is the fact that only one out of ten participants was male. Since the results from this one interview barely differed from what came forward from the others, the gender perspective was not addressed in the analysis. Further research should clarify to what extent male and female adolescent patients' preferences differ and how this may alter the final outcomes.

## Conclusion

In short, there is a need for a hospital environment dedicated to young people, whether this takes shape as a separate adolescents' ward, or simply as the grouping of adolescents on children's and/or adult wards. Even if adolescent patients' needs may in some ways resemble those of other patient groups, as a group they clearly have specific features and needs, and that this specificity is largely hidden in the process of development and transition they are undergoing.

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# Communicating information in health: Engaging students in design for health awareness.

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## Keywords

authentic learning, design education, visualising information, healthcare, empathy

## Introduction

Design is about people. As designers, focusing on people and their needs seems intuitive and natural. But this is not always the case with design students. Immersed in their personal practice, they regard design as an abstract activity—one that makes something look good or work well—but they seldom consider whether people who 'aren't like them' can understand or use their solutions. This paper examines the impact of an undergraduate design course that gave students who had no prior exposure to design for health and wellbeing the opportunity to visually communicate health information to be used by its intended audiences.

## The course and projects

Students enrolled in an undergraduate final year visual information design paper at AUT School of Art + Design in Auckland, New Zealand, worked in teams on real-world health projects. These projects were identified by (health) stakeholders to have information communication problems that might be improved through design. They were curated and managed by the Design for Health and Wellbeing Lab (DHW Lab). Based at Auckland City Hospital, the DHW Lab is a design studio where shared knowledge and expertise in the fields of healthcare and design contribute to solving healthcare problems (Reay et al. 2016). The projects were a pathway for students with no exposure to design in a healthcare context to connect with a more person-centred, empathetic way of approaching design. We were curious to learn how design students might solve reasonably complex visual information design problems given to them straight from a health and wellbeing setting, starting with the material that healthcare stakeholders had supplied. We also hoped that engaging 11 individual healthcare stakeholders from 11 different areas of Auckland's health and wellbeing community would give us the chance to demonstrate to as many healthcare stakeholders as possible how design can contribute to the sector.

## The assignment brief and aims

The assignment brief aimed to give students the experience of transforming health data and information into usable, understandable, and appealing health information for

specific audiences. The information design problems comprised 12 separate projects. Each project was commissioned by a clinician, health advocate, or health researcher connected with the DHW Lab. Students were placed randomly in groups of three or four, with each team working on two projects each, supervised by their tutor, who was a DHW Lab designer and researcher. Since students were not directly working with patients in the hospital, an authentic learning environment within their classroom—where learning activities were 'situated' in real-life design problems to develop usable design solutions—was important.

## Authentic learning

In authentic learning, knowledge is gained through complex but meaningful tasks and activities that relate to the world beyond the classroom. It is the real-world context, rather than a real-life setting that counts (Herrington and Herrington 2006). In this case, the authentic learning experience included guest visits by DHW Lab designers and researchers, and a class visit to the DHW Lab mid-way through the course. Having a tutor whose design practice was embedded in healthcare meant that students received guidance from an expert in design for health. As a result, students were steered towards best practice when considering people as consumers or users of their design outputs. Their tutor's 'insider knowledge' about healthcare, particularly about what works and doesn't work for communicating healthcare information helped to focus students towards designing for others, rather than themselves or for people like them.

## Methods

Students' engagement with, and experiences of the authentic aspects were evaluated through analysing data from an anonymous student paper evaluation questionnaire. A thematic approach was used to analyse this qualitative data (Braun and Clarke 2006). Preliminary codes were developed by detailed attention to the transcripts and grouped into common ideas or patterns. Of the 21 students invited to participate, 14 (67%) completed the survey. Students were also asked to write an individual reflective statement about their learning in this assignment.

Findings

Two main themes: the value of real-world learning and the need for empathy in design emerged from the anonymous student questionnaires. The potential for people to actually use their designs was both motivational and grounding. Students perceived that the need to design for the healthcare context was significant, and that healthcare was a continually changing discipline.
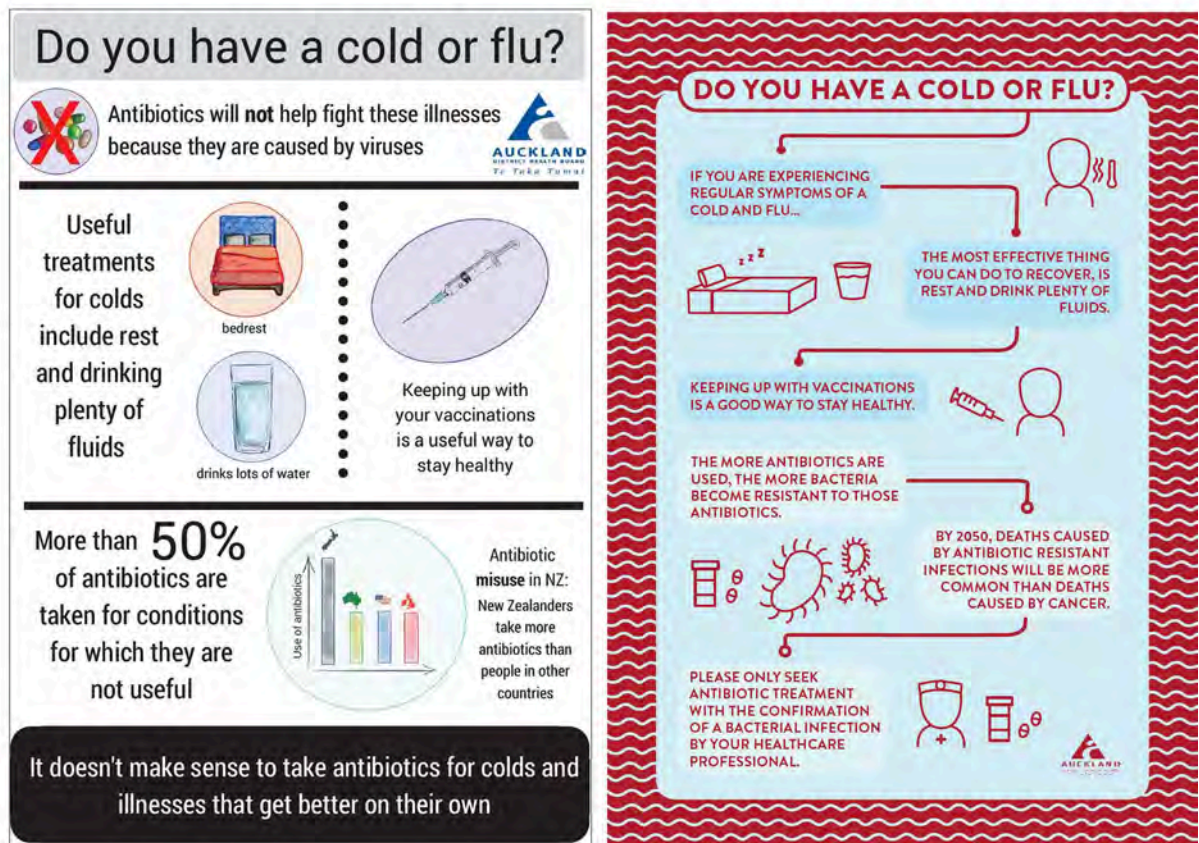
Figure 1. Antibiotic awareness poster, before (left) and after a student team's redesign.

The importance of empathy for users, and design for others were key themes. Students recognised how designing for different audiences required a mindset of not 'designing for myself', but for others (Figure 1). Designing for real problems and real people enhanced student perceptions of what Frascara and Noël (2012, 51) call "the social function of design".

Student reflections moved beyond empathy for people who would use their designed information to developing a deeper connection with the patients or actual subjects of the information they worked with. Through this, the importance of healthcare became more personal, and increased emotional vulnerability as students considered what it means to use healthcare services.

## Conclusion

By completing this course within an authentic learning environment, students experienced how designers can be integrated into the healthcare system to develop solutions for effectively communicating health-related topics. Health stakeholders, who were able to use the students' designs after the assignment ended, gained greater appreciation for design's impact in healthcare.

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# Stigma and the weight it carries when establishing a user experience Strategy: User research discoveries around mobility related issues

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## Keywords

Stigma, User Experience, Healthcare shopping

## Introduction

It is estimated that 10million people in the UK have arthritis (Arthritis Care 2016), with the most common condition being Osteoarthritis (OA). OA is often categorised as 'wear and tear' arthritis, affecting one in three people over the age of 45 (Arthritis Research UK 2013). Despite high numbers of people affected by arthritis and joint pain, the existing support through online shops is basic, demonstrating little understanding of the effect on people and how aids integrate with an 'average' home. This paper focuses on research into stigma and people's relationship with their condition, in order to inform an inclusive and desired user experience. Please note that throughout this paper 'people' refers to people with arthritis.

## Process development

## Literature review

In recent years the aids market continues to change, as occupational therapists in the UK move away from being able to prescribe products and aids below the value of £50 (Department of Health, 2010). This means the market is becoming more people focused, as people are now expected to purchase these products themselves. Usually new purchases are associated with happiness and a reward (Huffington Post ,2014) but in the case of arthritis purchases are often the responses of the body 'failing' and the resulting product is often specialist and reinforces that the person is 'different'.

## Research Methods

A co-design methodology and double-diamond process (Design Council UK,2005) was used. Fifty-four research participants with OA were selected, all were aged over forty and had a wide range of severities and had lived with the condition for different timespans. Methods included interviews, workshops and observations.

UX research methods have been implemented (i.e. card sorting to determine the information architecture and page hierarchy, usability testing on competitors' websites and user testing on various iterative prototypes) to discover an optimal website page

for finding the right product and the type of information needed for a person to make an informed choice and feel empowered.

# Results

## Stigma perception

Participants felt that aids present an untrue impression of who they are as an individual to people who visit their home - signalling they are 'different'; many reported that they removed or hid aids when people visited. Also highlighted was their dislike for visiting mobility shops, as they found them 'depressing and uninspiring' preferring to visit department stores to see what is on offer in terms of everyday products, without the stigma. The majority of research participants understood their needs and physical constraints, but found that most online information did not inform if a product would fit their requirements. Participants said they felt 'unsupported' in the buying process and expressed frustration at feeling that they have to pay more money just because they are 'disabled'.

## Product purchase

The majority of the research participants described having delayed buying specifically design aids. Observations in participant's homes showed that people usually buy many products with the same intended function (for example it is common to see between four and seven jar, can and bottle openers in the homes of our participants) as they search for a suitable one.

## Product finding

Interviews and workshops determined that many individuals do not know the names of products that could support them, and therefore there is a lack of knowledge in terms of the variety of products and choices currently available. The lack of empowerment created by unstructured information has been tackled during this research by testing new methods (points of entry) for finding suitable products. Using the joints as a point of reference proved to be the most efficient, and catered for various types and stages of arthritis. This alongside a more 'advance search' including specific difficulty filters associated with the joints selected has been demonstrated as being very supportive in combating 'confusing and demoralising' searches.

**Figure 1. Proposed method of entry (joints selection as the main method a questions and then supportive filters (shown here are the specific filters for joints of the hand and wrist)**

# Product use and specifications on a website page

The research highlighted that there are barriers around trust specifically in relation to the use of product images. Participants need to clearly see the the action(s) required in order to assess usefulness and desired models and the settings used in these images to be 'relatable' and show different arthritic conditions. In response to that the researchers made a series of short videos showing how a product is used and specifying the type of arthritis the model has. This has proven to be an effective way to communicating movements and create trust.

Other essential information that scored high in hierarchy tests have been VAT exemption, the weight of a product, as well as easy to understand measurements and details relating to assembly and disassembly for cleaning purposes.

Tone of voice has been identified as being poorly utilised. Participants mentioned, they did not feel empowered with one participant saying 'everything looks quite sad'. Details such as appropriate music (i.e. communicating a positive design and a desirable outcome) on videos as well as a friendlier tone of voice were used throughout the video explanations and the re-designed prototypes of the website. This was perceived as a more positive experience by participants.

## Limitations

This project has been conducted using qualitative research and is entirely based on the results derived from our research participants.

## Conclusion

This research has led to findings in user experience combining e-shopping with healthcare. A mix of products, aids and general household gadgets, provides a stigma free positive first impression. The content the website provides requires adaptation through images in a suitable home context, using models with arthritic conditions and a positive tone. The methods used for finding information should utilise the knowledge that people have available. The mentioned changes have been noted to positively change the online shopping experience for people with mobility issues and joint pains. This can create a trusted environment where online shopping is sensitive to people's feelings.

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# Foyle Reeds: How can design reduce suicide attempts at a specific place whilst at the same time improving the experience for all?

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## Introduction

Suicidal behaviour is a worldwide public health issue; internationally a person dies by suicide every 40 seconds (WHO 2014). The impact of a suicide in a public environment has a profound negative effect on those living nearby. This paper outlines a project aiming to tackle this by bringing together researchers, designers and the local community to reduce suicidal behaviour and improve well-being across a section of the Foyle riverfront in Derry Londonderry through suicide prevention interventions. Each year, an average of four people suicide in the river, though hundreds are removed or counted as a 'cause for concern'. This paper discusses 'Foyle Reeds', one element of the project, an art installation and suicide prevention barrier for one of the bridges, designed to protect and engage with the community whilst avoiding any sense of imprisonment. This project has received high levels of interest from statutory stakeholders and local government due to an increase of incidents on the bridge.

## Process and Engagement

The research question is: how can design reduce suicide attempts at a specific place whilst at the same time improving the experience for all?

## Methods

Using co-design methods (within the Double Diamond model (Design Council, 2005))

the project sought input from across the community, aiming to understand their experience of the bridges and environment, as well as their hopes and aspirations for the area. In an area known for the Troubles (a conflict between Irish Republican and Loyalist parties in the late 20th Century, creating a division in the community), it is important to create a neutral space for participants and to provide opportunities for both sides of the divide to have their say. The team created a research space at a number of large city-wide events connecting with over 5,000 people through research activities such as voting on key themes and outcomes, comment cards about activities people would like to see around the river and vox-pop interviews about focused topics. The team have conducted in-depth workshops with over 100 individuals, held site visits and observations with key stakeholders from the local statutory and community groups and engaged with people over social media through surveys, reaching over 10,000 people. The river search and rescue team regularly see zero incidences of suicidal behaviour during city-wide events, therefore the drive is to create a more sustainable approach to increasing footfall. This led to community consultation which focused on natural

surveillance by increasing visitor numbers whilst reducing the area's stigma. A large proportion of the study has therefore been carried out with the 'general population'; in depth interviews with suicideologists and people who have attempted suicide have been carried out in parallel.

## Results

Individuals highlighted several key concerns about the bridge, stating the suicide stigma, the wind and the height as reasons to not use the space. Many thought it was underused by pedestrians and cyclists, saying they would like to use the space due to good parking and connections to the city.

The bridge is nine storeys high, spanning 866 meters, with a high flow of traffic, carrying around 30,000 people each day (Northern Ireland Roads Site, 2007). It is located on the outskirts but is still largely visible from the city.

A multidisciplinary team of students used these insights to create a range of designs. Key challenges included use of the space at night (when the majority of instances occur (Connolly, 2007) and connecting the bridge to the community. Underpinning these challenges was the explanation for the reduction in incidents during busy events: suicideologists suggested that this is due to the individual feeling part of a community and connected to those around them.

The visual concepts were tested using stakeholder workshops and led to the creation of the 'Foyle Reed' bridge concept. A community buy-in scheme for the bridge was suggested which would allow the community to take ownership of the bridge and to connect and interact with it; lighting would increase the visibility of the area and increase footfall, and in turn this is hoped to reduce suicide in the area. A prototype will be trialled in December 2017.



**Figure 1. Foyle Reed Bridge Concept**

## Discussion

Public opinion of barriers is often negative as they imprison the location and general population whilst maintaining the negative associations of suicide. Foyle Reeds is inspired by the 'common reeds' which surround the riverfront, providing shelter for wildlife whilst retaining the spectacular views. The barrier will be built using a modular design, complying with suicide prevention guidelines (Public health England,2015,26). By day, the bridge becomes part of a sculptural trail and provides an element of shelter and safety for pedestrians. At dusk the bridge will come alive, lighting up and interacting on three levels. Firstly, people will be highlighted as they traverse the bridge by lighting which increases in brightness, allowing CCTV staff to track people more easily. The second level of interaction is the community buy-in scheme: members of the community 'buy' a reed and can digitally control the colour of the light. The third level allows for the bridge to be more integrated into the city during wider public engagement e.g. for breast cancer awareness the bridge would light up pink.

## Limitations

This project is context specific as it has been co-designed with local people, tourists and organisations.

## Implications

The project, though driven by the context, has implications for other environments and locations associated with suicide. These methodologies are applicable in tackling suicide prevention in a less stigmatising way and improving the environment for all.

## Conclusion

Foyle Reeds has stakeholder and community buy-in, with funding through the private sector via a non-suicide focused positive marketing campaign being sourced. As the project moves towards the procurement phase, the measurement of impact on the community, the environment and the space is under way. Quantitative and qualitative data has been collected, and local statistics gathered, to be cross referenced with data after the installation of the barrier, planned for mid 2018.

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# Design for well-being: Examining Aceh post-tsunami houses

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## Keywords

Post-disaster, Housing Design, Well-being, Aceh, Tsunami

## Introduction

On December 26, 2004, the 9.1 Richter scale Indian-Ocean earthquake and its associated high tsunami struck the Aceh province, Indonesia. One of the largest natural disasters in Aceh's history. The disaster affected the housing and settlement sector substantially. Up to 139,195 homes were destroyed or severely damaged (BRR Report 2009) with 20% of the Acehnese population made homeless (Bappenas, Jan 2005). Thus, post-disaster housing becomes highly significant for long-term recovery after such a disaster (Hirschon and Thakurdesai 1979). A large number of houses have been built in a short time to quickly provide adequate shelter for the survivors. In quantity, this outcome is an accomplishment. However, in term of qualitative accomplishment, particularly how far the design of such houses accommodates the long-term well-being of the occupants still needs to be studied. This study examines the design of the post-tsunami housing built by different donor agencies in Aceh. The layout, size and typology style of the houses were analysed. This study focuses on the question of how the survivors reacted to the design of their new post-tsunami houses and what were the implications for their well-being. It is focusing on permanent houses as the final stage of housing reconstruction (Lizarralde, Johnson and Davidson 2010). The aim is to increase understanding of the housing design for well-being especially in the context of post-disaster housing design.

## Method

A qualitative approach was used for this study. Six houses funded and built between 2005 and 2007 by different donor agencies have been selected for the analysis. The houses represented different categories that are the standard house, stilted houses, complete house, minimum houses and design-it-yourself houses. The selection of the houses was carried out through observations in the field, consulting with community leaders, consulting with donor agencies and by studying their reports and documents.

During the observations, the design of the houses, including layout, typology, material and construction, have been sketched and photographed on site. It was supported by in-depth interviews with homeowners. The data gathered from the observations were analysed by synchronising with the interview records. The results then were organised based on the level of how far the designs of the houses accommodates the long-term well-being of the occupants. The analysis was combined with a desktop review of

documents and literature from donor agencies. To support the findings, selected quotes from respondents were added.

# Post-disaster housing design

Understanding the design of post-disaster housing is important in order to provide better shelters for the survivors. The houses must be designed and built in an appropriate way (Rand, Hirano and Kelman 2011). The well-being of the survivors should be a priority (Arlikatti and Andrew 2012) to ensure occupant satisfaction. There are two main aspects that need to be considered in housing design. The physical aspects including location, typology, size and layout, material, technology, and the non-physical aspects such as family cultures, practices, lifestyles, habits or customs. Lawrence (1987) states that the analysis of spaces and non-physical variables which influence the design and uses of house over the course of time are important in understanding the nature of houses, the daily activities in and around the houses, and the correlated customs of the occupants. Furthermore, Lawrence (1992) argued that the values and lifestyles of the inhabitants are the main concern emerging from numerous housing studies. The other important factors that need to be considered in housing design and planning include daily living practices and social interactions either internally among the family members or externally with neighbors or visitors (Broadbent 1988); (Zetter and Boano 2010).

# Significant findings

As the analysis of this study focuses particularly on the physical nature of housing types, based on site observations, there are some significant physical design differences:

1. Prototype houses: two bedrooms, a living room, a toilet, a veranda, and a half open kitchen
2. Stilted houses: with extra space underneath for multiple uses
3. Large house: two bedrooms, a living room/dining room, a veranda, a kitchen, a bathroom and a separate toilet
4. Basic houses: one bedroom plus toilet; or no toilet if occupants opt for two bedrooms
5. Standard houses: with two bedrooms, a living room, a toilet and a veranda
6. Design-it-yourself houses: beneficiaries design their houses and house layouts themselves, provided donor's budgetary norms will be met

This study found that in most of the designs of the houses, there are not enough spaces for occupants to perform their daily activities. Sometimes the rooms are too small or even in some of the designs, there are no kitchen, toilet or family room provided. The absence of those rooms has affected the well-being of the occupants. It includes the religious experience, cooking and joint family dining practice, family contacts, public-private and gender segregation space. Taking technical housing aspects into consideration, especially the quality of materials and building construction, this study also found that inadequate quality affects the well-being standards of the occupants. For example, poor quality timber used for construction pillars and walls made of asbestos made living in that house dangerous. The pillars eaten by termites made houses unsafe prone to collapse. In term a typology of the houses, this study confirmed

that ground level houses were the most appropriate contemporary post-tsunami house type compared to stilted houses. This is mainly due to well-being reasons, as stilted houses do not suit physically disabled people, people with health problems and toddlers who find it hard to go up and down the stairs.

## Conclusion

Big disasters such as the Aceh tsunami not only caused the loss of human life but destroyed the homes of thousands of people. In 2009, the housing reconstruction phase was completed with 147.000 new houses built for survivors (BRR Report 2009). Targeting a quantitative number of houses for survivors in a fast time-frame is a positive goal, but it is also important to recognise the quality aspects of house design by taking the well-being needs of traumatised individual survivors seriously enough. This study provides an understanding of the impact of the design of the post-disaster houses in term of the well-being of occupants. It also increases the understanding of relationships between the physical forms, sizes and layouts of housing on the one hand, and the non-physics of socio-cultural phenomena informing people's sense of well-being and happiness, on the other. This study will influence donor agencies to be more concerned and sensitive to long-term well-being of occupants by contributing to improvements in planning and building of new housing for populations hit by natural disasters.

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# Dear pelvic floor exercises: A qualitative study among health professionals, pregnant and postnatal women

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## Keywords

pelvic floor exercises, ethnographic study, design for health

## Introduction

This paper presents the findings of an ethnographic design study that explored the experiences women and health professionals have with pelvic floor exercises (PFX). We suggest that the findings can inform the development of future PFX devices.

PFX has been shown to prevent or resolve pelvic floor disorder (PFD) symptoms (Boyle et al. 2012; Moossdorff-Steinhauser et al. 2015; Price, Dawood, and Jackson 2010). However, women do not conduct the required amount of PFX during pregnancy and after giving birth and are often conducting exercises incorrectly (Mason et al. 2010; Buurman and Lagro-Janssen 2013). This puts women at high risk of experiencing PFD symptoms (Mason et al. 2010; Buurman and Lagro-Janssen 2013; Moossdorff-Steinhauser et al. 2015), which are debilitating in terms of physical and mental health and when ignored can worsen over time (Porrett 2010, 7; Haylen et al. 2010, 3.3.2).

PFX facilitating devices seek to aid this issue. In order to pull away from female health inequality and resulting stigma around PFD symptoms we must look to develop these designs with a strong awareness of the experiences women and health professionals already have with PFX.

## Methods

We carried out an ethnographic design study through semi structured interviews and cultural probes (Gaver et al. 2004) with three health professionals in pelvic floor health and nine pre and postnatal women (22-35 years old with babies from 3 weeks to 12 months old; one woman was 27 weeks pregnant). The cultural probes involved: describe PFX through a metaphor; write a love or break up letter to PFX; take a photo of spaces PFX is most commonly done in; and describe any devices or apps that you use for PFX. We performed a Narrative Analysis (Connelly and Clandinin 1990).

## Results and discussion

We constructed the four themes below.

# Safety and professional support

The health professionals emphasised the importance of screening and professional diagnosis to ensure the women's safety. Women expressed a want for education, guidance to ensure exercises are correct and safe; as well as motivation and reminders to do the exercises, as they believed PFX were perceived as elusive. Women described their relationship with PFX as *"rocky", "unknown"* and *"on and off"*. Some responses to a task that required them to write a "love or break up letter" to their PFX included:

*"I have forgotten everything I was told 3 years ago other than to squeeze and hold for a bit. Love from, Me ";*

*"is there anything new we can do to set the spark alight again?"*

Some women highlighted that the first time they performed PFX, they felt it was a strange sensation because no one had told them about it before. In response to an activity asking them to describe how they "met" PFX, they mentioned: When we first met:

*"I felt weird and uncomfortable because no one has ever talked about you before";*

*"I felt strange, because I hadn't felt you move before".*

# Teaching PFX with metaphors

A focus on metaphor in the fieldwork sought to understand how exercises are taught, given the difficulty for some women to understand how to activate their muscles.

Each of the health professionals talked about an upward movement; whether it's *"squeeze and lift"* or *"pull up"*:

*"What I usually do is I show them the pelvis and I tell them it's like a sling… I'll get them to imagine a point in the centre of that sling and feel that they are drawing that up".*

Women mentioned the following metaphors:

*"So, metaphors I'd use would be imagine a plunger";*

*"It's like tightening the lid on a bottle";*

*"It's like pulling a tampon up inside your vagina without using any hands";*

The physiotherapist gave an example of a metaphor used to help women to relax their pelvic floor:

*"Imagine that you're sitting on a silk scarf and pulling up, into the vagina and then dropping it down".*

## PFX for Busy Schedules

Many of the women's responses showed women's relationship to PFX is influenced strongly by their personal schedule. Additionally, the women explained that they will be most likely to conduct PFX in comfortable spaces, convenient places and when alone:

*"[I] am by myself or at least don't have a child on me such as in bed, or the shower or in the car."*

*"We are at our best together when I'm bored and stuck inside."*

## Device Concerns and Feedback

An insertable device was suggested to be an additional barrier for pre and postnatal women to completing their exercises. Clinicians explained that postnatal women find it hard enough to try and fit exercises into their day, and are *"generally over being poked and prodded."* In addition to this, it was stressed by the physiotherapist that a device should not be used internally, six weeks after an operation, six weeks after giving birth or if there is an infection present.

## Conclusion

We suggest that designers of apps and devices that intend to help women carry out pelvic floor exercises can use these findings to design systems that better address actual concerns of women in the following ways that current systems don't address: The app should facilitate safety and professional support through accurate screening; it should teach PFX using a variety of metaphors currently used by clinicians; it should have reminders for PFX that integrate into busy schedules; and the device should address concerns and feedback pointed in the paper.

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# NZ Fauna AR: an augmented reality exergame system to assist stroke survivors with independent rehabilitation.

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## Keywords

Augmented reality, stroke rehabilitation, engagement, exergames.

## Introduction

The American Heart Association recommends that stroke survivors should engage in at least 30 minutes of moderately intense physical activity at least four days a week to reduce the chance of a recurrent stroke (Billinger et al. 2014, 2540; Sacco et al. 2006, 584). As many as 69% of stroke patients fall below this recommended level of physical activity (Shaughnessy, Resnick, and Macko 2006, 16–17) with approximately 27% of survivors adopting or returning to a sedentary lifestyle (Billinger et al. 2014, 16). Physical activity helps muscles remain active, improve physical function, and helps stroke patients regain independence within their home and community (Burke et al. 2009, 1086; Morris 2016, 3; World Health Organization 2002, 31).

For a patient to be engaged in their rehabilitation, they must express a deliberate effort and commitment towards their recovery goals demonstrated through active, energetic participation in their rehabilitative activities (MacDonald, Kayes, and Bright 2013, 112). Embracing personal progression and creating an instance of meaningful play have both been suggested to facilitate engagement in voluntary activities (Burke et al. 2009; De Schutter and Vanden Abeele 2008; Salen and Zimmerman 2003). Furthermore, video games have proven to be a successful medium for promoting participation in active, rehabilitation related activities (Burke et al. 2009; Flores et al. 2008; Popovic et al. 2014).

The World Health Organization (WHO) (2002, 31) has highlighted the need for home healthcare that empowers patients to self-manage their condition. Recent evidence suggests that the integration of digital games with rehabilitation interventions can be used to create a unique environment that delivers a high-quality, intensive rehabilitative experience that may be suitable for in-home use (Alankus et al. 2010; Bower et al. 2015; Burke et al. 2009, 2113; Shah, Amirabdollahian, and Basteris 2014). At the same time, emerging augmented reality technologies offer the ability to seamlessly integrate digital objects into the real world, generating an immersive, unique virtual world. Augmented reality leverages the physicality of the real world to create an engaging, personalised experience that allows users to interact freely with the real world in entirely new ways.

The aim of this research was to explore the incorporation of an augmented reality exergame into the rehabilitative process, and furthermore, determine the technologies potential to provide meaningful and engaging rehabilitative experiences.

## Methods

This research was guided by a human-centred design (HCD) framework (Norman 2013, 8). The researcher went through a comprehensive research through design and iterative design process where healthcare professionals and stroke survivors were involved in each phase of the development process. Patient's and therapist's holistic needs were represented by design criteria that informed the design and development of the rehabilitative system. The proposed design criteria were derived from background research on video games, engagement and rehabilitation.

Five participants were involved in the testing of the iterative prototypes (male n=2, female n=3). The mean average was 70 years. All participants had reached the chronic stage of recovery with more than 12 months since they had experienced a stroke.

During the usability tests, participants were encouraged to 'think-aloud' which revealed aspects of the prototypes that delighted, frustrated or confused participants. The testing sessions were concluded with a System Usability Scale (SUS) questionnaire (Brooke 1996) and a semi-structured interview. The feedback from these testing sessions allowed the researcher to iteratively refine the developed rehabilitation system while ensuring its validity as a substitute for traditional rehabilitation interventions.

## Results

The final output of the design research process was a handheld augmented reality rehabilitative video game called NZ Fauna AR. NZ Fauna AR was an educational location-based game that converted prescribed sit-to-stand exercises into active gameplay. NZ Fauna AR utilized Google Tango's augmented reality platform to provide an immersive experience that was structured by the configuration of the player's physical surroundings. The use of procedural generation techniques enabled the video game to be played seamlessly within any indoor space of arbitrary size – giving the player control over their play space.

Participants were more interested in interacting with the rehabilitation system once they understood that the purpose of the game was that it could be used as an aspect of their rehabilitation at home. They described it as a great rehabilitation tool that would be useful for most people post-stroke. All five participants could sufficiently perform the facilitated sit-to-stand exercises while playing the video game. Four of the five participants demonstrated the importance of a system's identified benefits being connected to the participants' personal goals that they bring to the gaming experience.

**Figure 1. NZ Fauna AR.**



**Figure 2. Prototype testing with stroke patients.**

## Discussion

Findings from the user testing sessions suggested that the developed augmented reality video game, NZ Fauna AR, could facilitate sit-to-stand exercises in an unsupervised environment. Facilitating prescribed rehabilitation exercises through the medium of a video game allowed patients to receive immediate, dynamic feedback on their progress, stimulating emotions of pride and delight in players as they see the immediate outcomes of their engagement. However, the small sample size of participants involved with the testing of the developed prototypes may not have been a representation of the broad demographic of stroke patients. While the findings are not generalisable, they offer a situational representativeness relevant to the specific context and participants that were involved in the project. Further research should involve more participants to increase the validity of the studies.

## Conclusion

NZ Fauna AR has contributed towards the greater field of rehabilitation systems research by exploring how emerging augmented reality technologies could enhance stroke survivors rehabilitative experience by better satisfying their holistic needs. The researcher aimed to shift the focus from clinical-based rehabilitative systems, that required the help of researchers or clinicians to be operated by stroke survivors, to home-based rehabilitative systems that empowered patients to self-manage their conditions.

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# Exergames for healthy ageing: Inclusion through design

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## Keywords

Exergames, healthcare, participatory research, value, seniors

## Introduction

Presently, we are confronted with the challenge of an ageing population at risk of reduced physical activity (United Nations 2015; Harvey et al. 2013). Falls among the elderly segment are an alarming problem, which often causes hospitalization and reduced physical autonomy due to severe fall injuries (WHO 2008). Evidence suggests a close link between advancing age and greater levels of physical inactivity (Scholes & Mindell 2013), which seems to increase the probability of future falls. Exergames have emerged as an innovative way for seniors to avoid a sedentary lifestyle and combat the degenerative effects of ageing. The easy-to-follow routines and gamified nature of the activities motivate the seniors to be physically active through playful interactions. Given the rise in technology-enabled initiatives aimed at the elderly population, this paper highlights the need to involve the elderly as experts of their own experiences (Visser et al. 2005) and co-designers of future healthcare technologies. This paper reports on a series of prototype trial sessions, rooted in the tradition of user involvement, conducted with the elderly to develop exergames for fall prevention. By focusing on local knowledge and values within the design process, the authors discuss how adopting participatory approaches may facilitate developers' understanding of the seniors' values, technology appropriateness, and propensity to use, thereby improving the likelihood of adoption and positive health-related outcomes.

## The Exergame Case

This paper draws on the data collected through an ethnographic case study (Segelström 2015) with the patrons of a day care centre in Portugal. The initial prototype was developed with input from physiotherapists and advisors from the Coimbra Health School. Thereafter, elderly persons were invited to a living lab where they tested the gaming platform and sensors. Their feedback was collected using system usability scale questionnaire (Brooke 1996) augmented with short interviews based on which the Fraunhofer Portugal developed a whole set of exergames.

As part of the study, the exergame platform was installed in the main 'activities' room of the centre. The seniors had the option to either participate in usual activities offered by the centre or try a new activity that combines video gaming with physical exercises. Those who opted for the exergames were observed over a period of three months and interviewed by the researcher, who also documented the difficulties the elderly and caregiving staff encountered throughout the sessions.

# Preliminary Findings

## Value matching

The early-stage interview data revealed that value is derived not only in the physical activity, but also in the cognitive stimulation and social interaction.

*"What would make me play, first because I have to concentrate in what I am doing and it is good for my brain. And because I like to play games on the computer. I'm an addict."* *(E15)*

*"The distraction, the company, the exercise. Everything does well to you."* *(E13)*

The exergames were therefore designed with multi-player modes comprising both cooperative and competitive games that include memory stimulating elements.

## Technology appropriateness

Exergames need to be designed with a particular focus on the age segment to assure meaningful exercising experiences. Majority of digital game developers/designers are male, in their early thirties (Williams et al. 2009) who cannot easily understand value-in-context (Chandler & Vargo 2011) of their target audience. They need to move away from so called "I" methodology towards user-centred design approaches to assure better acceptance among the elderly. For example, the mobile phone, which is used to start the game and works as a sensor, is supposed to be put in one's pocket. The researcher observed that the developers did not take into consideration that old people either do not have pockets, do not wear jeans or have loose pockets. This causes problems because the phone is supposed to be in a vertical position. If it changes position, the signal cannot be processed in the same way to identify the movements.

**Figure 1. Participatory gaming session at the day-care centre.**

# Propensity to use

In the beginning, it was difficult to get the seniors to try the exergames. Over time as they understood the concept and became more familiar and comfortable with the technology, their willingness to engage with the exergame platform rose. They were less hesitant to switch from other activities to playing exergames.

# Discussion

This paper highlights the advantages of engaging the elderly as innovators in their own care. The authors encourage more rigorous employment of participatory approaches (Schuler & Namioka 1993) in the development of exergames as they can help in circumventing barriers that hinder the improvement of seniors' health. The findings show there is a discrepancy in developers' expectations and the seniors engagement with the technology. Observations and collected qualitative feedback might help alleviate elderly frustrations and avoid mismatches with seniors' values resulting in better outcomes for all involved. The high drop-out rate from physical activity programs can be reduced by harnessing seniors' constructive criticism. Further, more active involvement from the elderly as user innovators during the earlier stages could spur innovation that better caters to their needs.

This study offers an interesting perspective on inclusion through design, yet the early stage of the project limits more long-term conclusions. This opens avenues for a longitudinal study that might strengthen the claims of improved adoption rates through participatory approaches. Another potential limitation of participatory research with technology prototypes is that the elderly do not feel at ease to comment on technology appropriateness and are unable to fully express the encountered system difficulties since they oftentimes blame themselves if something goes wrong and do not experience the problem as a technology failure.

# Conclusion

While exergames show positive effects on the improvement of physical, psychosocial, and cognitive health of the elderly (e.g., Rosenberg et al. 2010), the acceptance of gaming technology still represents a barrier in realization of health-related outcomes. The aim of this study is to show how employing participatory approaches with users during the prototyping phase can make user's value-in-context more explicit to exergame developers/designers and positively affect propensity to use.

# Acknowledgements

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# Psychosocial Needfinding

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## Keywords

Needfinding, Psychosocial, Intervention, Reflection

## Introduction

With pediatric stem cell transplantation (SCT) comes a difficult set of circumstances, contributing to the negative psychosocial effects commonly experienced by both children and their family members, including psychological distress, anxiety and depression (Pot-Mees 1989). SCT typically requires chemotherapy and sometimes radiation therapy. For one to several months, children must remain in an isolated, germ-free hospital room, with major restrictions on exposure to outdoor elements, visitors, and food. Three months after hospitalization, 80% of children undergoing SCT show symptoms of post-traumatic stress (Stuber et al. 1991).

Negative psychosocial effects are pervasive in healthcare. To demonstrate, experiencing *any* life-threatening illness, as a patient or family member, can be a qualifying event for PTSD.[1] To design effective interventions, designers must be able to identify accurate targetable needs. However, eliciting perspectives from users that reveal the necessary depth of their experiences can be challenging, and doing so efficiently is particularly difficult. Even for adults, such deep needs are difficult to perceive, let alone articulate.

The technique and set of tools that we present support this required needfinding process. Built on concepts of cultural probes (Gaver et al. 1999) and art therapy (Driessnack 2005), they effectively motivate and support participants in private sessions to reveal difficult aspects of their past experiences in isolation. Followed by a rigorous analytical process of interview content, psychosocial needs[2] become evident. This research will benefit designers and healthcare professionals looking to improve patient and family psychosocial well-being, particularly through scientific interventions; as well as designers of emotionally- and psychologically-vulnerable user populations. Evaluations suggest that the technique also therapeutically benefits participants.

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[1] According to the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR)

[2] Human needs pertaining to emotional and mental well-being, that are heightened in a given context

## Methods

Clinical design research

Families of children who had received SCTs at an academic hospital in the last 3 years were invited to participate in a private research session. 10 families (20 people) participated. In the sessions, 30 minutes were spent creating a project (a reflective activity), and 30-60 minutes were spent in open discussion (an unstructured interview)[3] Interviews were transcribed and

analyzed via a modified thematic analysis (Boyatzis 1998). Sessions were evaluated via open-ended and Likert-scale survey questions.

# Culture and artifacts

The tone of the sessions was intentionally sincere and heartfelt, emphasizing the gravity of the SCT experience. Each participant was given a personalized gift box and card, hand-made by the researchers. (Figure 1) They were instructed to help others currently undergoing SCT, by sharing their own experiences.



**Figure 1. personalized gift boxes, with an instructional card, holding a set of reflective activity cards**

We simultaneously crafted a more light-hearted culture based on that of design thinking, to support creative expression (Kelley and Kelley 2013). The setting was informal, sketches were rough, and prompts were ambiguous.

Reflective activities

The gift boxes held a set of activity cards, offering ways to reflect through constructive activities. (Figure 2) The range of options covered the breadth of ways that we conceptualized for psychologically processing experiences.
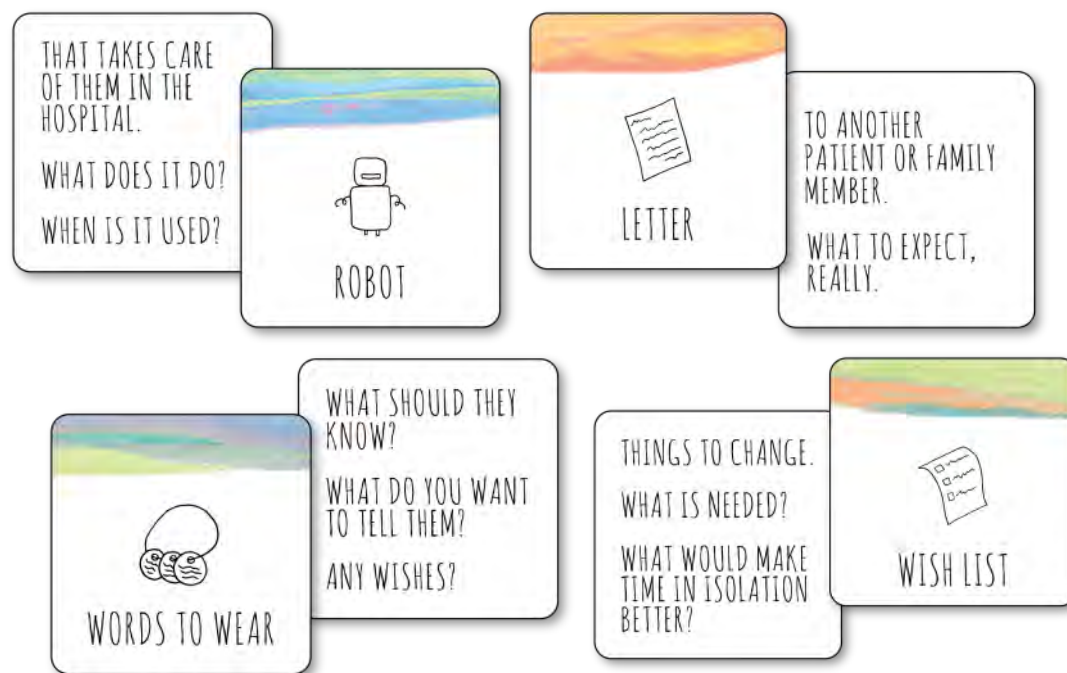
**Figure 2. a sample of reflection-prompting activity cards**

Results

Tangible reflections

Participants made a variety of projects, mostly as letters or supportive gifts (Figure 3). Offered the flexibility, some participants did multiple activities, came up with their own, or chose to do none.

Revealing conversations

The conversations were emotional. Topics ranged from traumatic experiences with chemotherapy, to fears of dying, to interactions with staff. They covered specific problems as well as more general views.
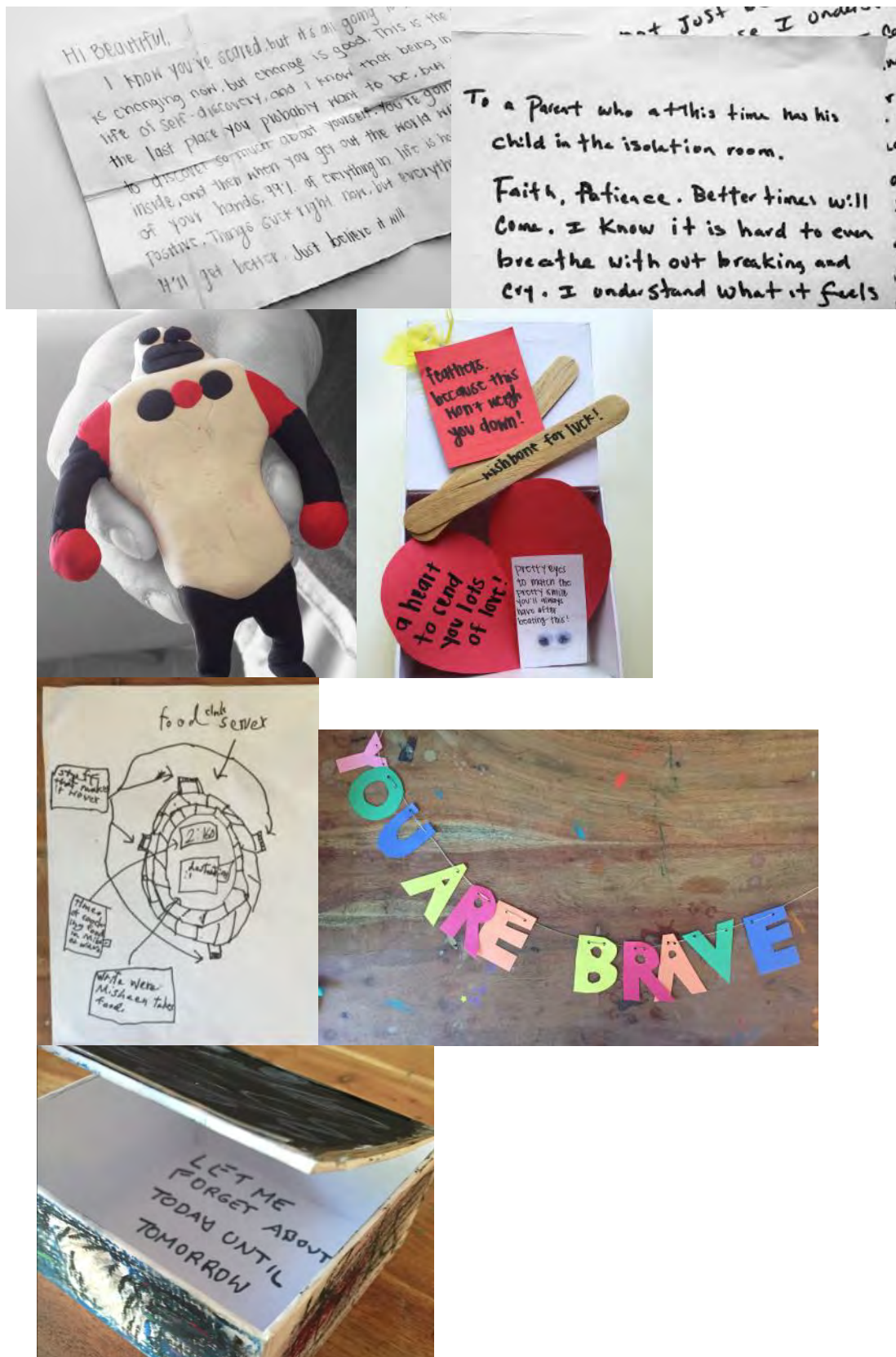
**Figure 2. Selection of reflective projects by participants, made for someone else going through a similar experience**

Psychosocial needs

In the analysis of interview content, 5 psychosocial needs were identified as overarching themes (Figure 4): Emotional and Mental Strength, Social Relatedness, Autonomy, Connectedness, and Normalcy.
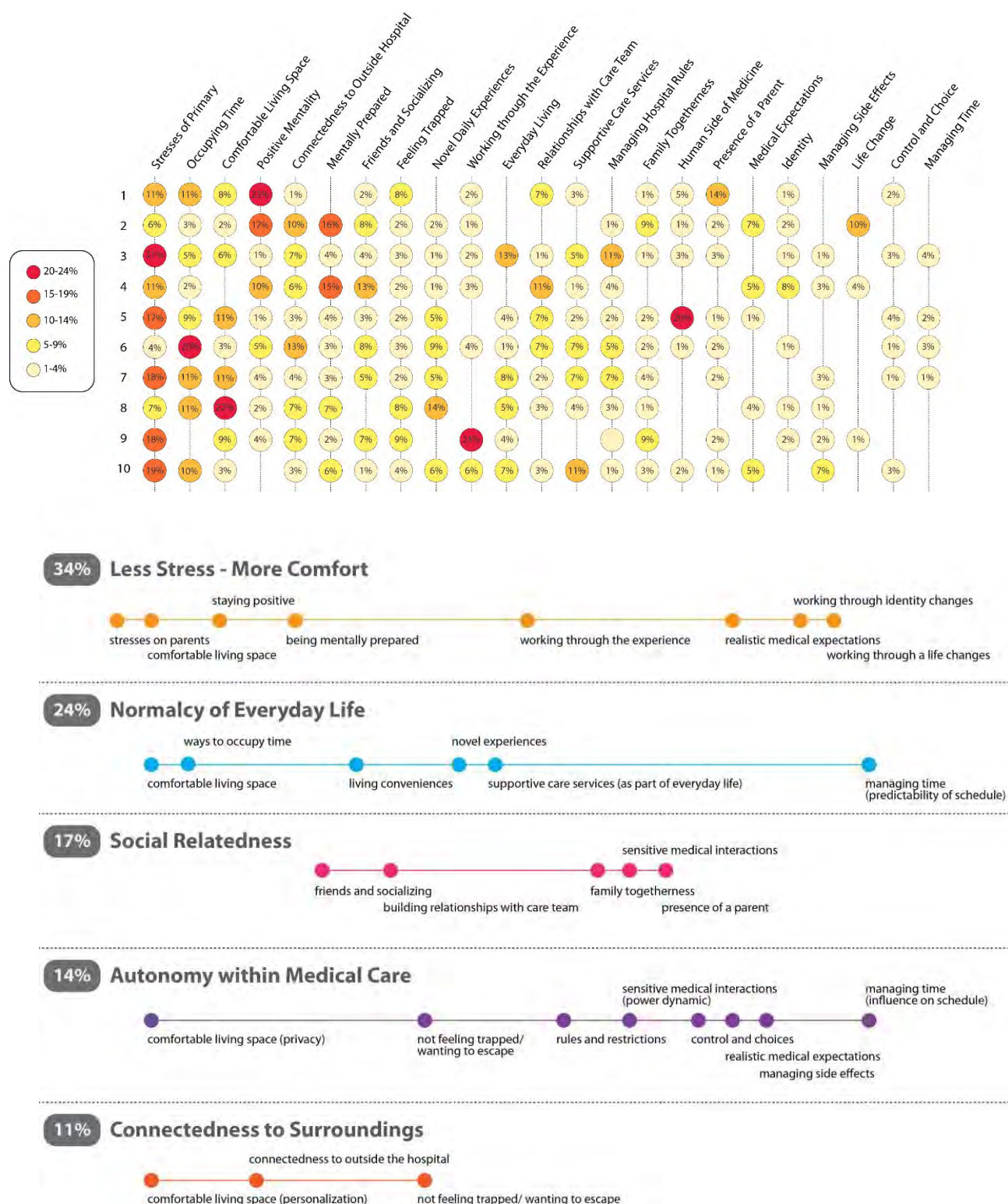


**Figure 3. (a) amount of each topic discussed in each interview; (b) overarching themes with represented topics.**

Participant evaluations

Surveys evaluated the effectiveness of the process in supporting creative reflection and expression, as well as the user experience. Overall, interviewees were engaged (even excited), and immersed in their projects. 84% of interviewees highly "opened up about [their] experiences." For 72% of responding participants, the sessions had immediate high impact on six psychological needs (Sheldon et al. 2001), including self-actualization ("feeling a deeper sense of purpose in life.") Responses suggest the process had a therapeutic effect, particularly through emotional expression and cognitive reframing. [4]

## Discussion

With the identification of psychosocial needs, we are able to guide the design of scientific psychosocial interventions. Within design practice, needs generally take a more practical form (Patnaik 2017). Although this study revealed numerous practical needs, we honed in on more fundamental, internally-focused psychosocial needs (e.g. for autonomy). These can act as targetable scientific outcomes that can be measured to assess the effectiveness of designed solutions, in a hypothesis-driven research approach. In some cases, new measurement techniques and tools may also be required.

Conducting the laborious analysis of user interviews that yielded these needs can be too time-consuming for some design efforts. The process can be streamlined, with care to maintain rigor around interpretation into psychosocial needs.

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[4] Among 5 effective aspects of a supportive group therapy for breast cancer patients (Spiegel 2015)

Understanding psychosocial needs can guide the strategy for design efforts in a variety of professional contexts (e.g. for technology design, psychosocial practice, clinical research, or hospital administration). More specific design needs can then be created to account for relevant practical constraints.

## Conclusion

Here we adapted methods of creative reflection and expression used in design and psychotherapy to unlock needfinding potentials in vulnerable user populations. The technique and set of tools are effective at uncovering the latent psychosocial needs of patients and families. Importantly, they can be used within a clinical and scientific research context, offering immediate therapeutic effects.

## Acknowledgements

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# Review of waste management service design for health and wellbeing in rural and remote Aboriginal and Torres Strait Islander communities

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## Keywords

waste, health, Aboriginal, design innovation

## Introduction

Indigenous Australian families living in outer rural and particularly remote Indigenous managed community service locations experience considerably different waste impact challenges in both relative and absolute terms. Our summative analysis of the literature suggests that most remote communities continue to struggle to reliably collect, and sustain, domestic waste management systems designed to operate in urban street curb conditions, with very different economic, service, and climatic seasonal factors.

Since European colonisation, the growth and development of sedentary human settlements across coastal, rural, and outback Australia has introduced extensive lifestyle and place-based challenges for Indigenous Australians. One of these challenges has been the concentrated accumulation of rubbish (in particular, domestic solid/physical waste that normally finds its way to landfill) and its impact on health, habitat, and wellbeing. While most Indigenous Australians now live in urban and inner/outer rural regions, about 98% of discrete Indigenous Australian communities, representing about 15,000 houses, and about 90,000 people, are located in outer regional, remote and very remote Australia (Australian Bureau of Statistics 2003). Typically, these communities are small in size, sparsely dispersed, away from major markets and central service economies, often in extreme climate locations, and have relatively low local cash flow to socially, economically, and technologically sustain "conventional" waste management technologies designed for and used in urban waste collection, processing or environmental-health public services.

We found that while the literature suggests an understanding of the broad causal relationship between personal health and substantial degrees of accumulated waste – such as human contact with toxic and harmful materials, trauma due to sharp objects, vector based diseases, parasites, and with harmful bacteria that can harbour and establish themselves in ideal micro-climate conditions in waste – the literature has a noticeable 'gap' in any serious studies that map the type and extent of failed waste management services and the causal health impact in rural and remote Indigenous Australia of such failure.

Waste is acknowledged to be a complex phenomenon in rural and remote Indigenous Australian communities. It has several categorical manifestations of its form, each

potentially responding differently to local and regional conditions in how waste affects the environmental health and wellbeing of communities. This relationship between context and waste categories offers a basis for recommending place-based strategic public health priorities across Australia's diverse range of remote and rural communities. This targeted review of the literature offers categories of waste systems and services that WasteAid and similarly interested organisations may use to prioritise for developing locally and regionally sustainable waste management and innovation outcomes.

# Service and product design brief

Remote Indigenous communities experience poor health compared to non-Indigenous Australians. Remote Indigenous communities also experience greater deprivation across the social determinants of health compared to non-Indigenous Australians. Many essential services that are taken for granted in non-Indigenous communities are either absent or inadequate in remote Indigenous communities. Poor solid waste service design and technologies may be one factor that contributes to this health gap. Reasons for this inequity are myriad and cannot be cogently reviewed in the literature without reference to the related challenging policy, or interpretation of policy landscape.

# Health status of Indigenous Australians

Indigenous Australians have significantly poorer health outcomes and a lower life expectancy compared with non-Indigenous Australians. It is estimated that Indigenous Australians suffer an almost two-and-a-half times greater burden of disease than non-Indigenous Australians (Australian Institute of Health and Welfare, AIHW 2016). Chronic diseases, including cardiovascular disease (CVD), and mental and substance abuse disorders contribute significantly to the burden of disease experienced by Indigenous people (AIHW 2016). In addition, the incidence and severity of infectious diseases is much higher in the Indigenous population than in the non-Indigenous population (Gracey and King 2009). Hospitalisation rates for Indigenous Australians are also significantly higher than for non-Indigenous Australians, despite a greater proportion of Indigenous people living in remote areas which has been shown to disproportionately impact on access to health care services (Australian Institute of Health and Welfare 2014, Woods et al. 2015).

The reasons for these disparities are complex, and include a range of interrelated historical, social and environmental factors. While it is acknowledged that these factors impact on health concurrently and cumulatively (Gee et al. 2014), this review will focus on the environmental determinants of Indigenous health, with an emphasis on the impact of solid waste on Indigenous health and wellbeing in remote communities.

# Conclusion

A number of environmental factors may have a significant impact on health in remote Indigenous communities. Ware (2013) highlights that while a causal relationship has not been established between the living environment and health there is extensive evidence consistently linking the two. Holman and Joyce (2014) estimate that poor environmental

health in regional W.A. is responsible for approximately 20% of premature mortality amongst the Indigenous population.

This may be related to:

Environmental factors unique to remote communities, including exposure to geogenic dust, biomass smoke and heavy-metal contaminated water (Clifford et al. 2015),

Geographic isolation and inadequate transport and communications infrastructure (Bailie et al. 2002), and

Living conditions within communities, particularly housing and related infrastructure such as power, water and waste management, household overcrowding, personal and community hygiene and poor dog control (Bailie and Runcie 2002, Gracey and King 2009, Gracey, Williams, and Houston 1997, Torzillo et al. 2008)

The impact of poor housing on Indigenous health in remote communities has received a great deal of attention in the academic literature (Torzillo et al. 2008, McDonald et al. 2010, Bailie and Runcie 2002, Bailie et al. 2010) and in Government policy (Ware 2013). The importance of a safe water supply, and sewerage and liquid waste removal is also acknowledged in the effort to maintain hygiene and prevent gastrointestinal disease (Bailie et al. 2002, Gracey and King 2009, Gracey, Williams, and Houston 1997). While solid waste disposal is often mentioned in the same breath as water, sewerage and liquid waste disposal; its impact on health in remote Indigenous communities is not well understood and it is often considered a visual or aesthetic problem rather than a public health problem (Carson and Bailie 2004). The causal link between solid waste and human health is also lacking in the non-Indigenous specific literature (Giusti 2009). Despite this conclusion, rubbish collection is included in the Atlas of Health Related Infrastructure in Discrete Indigenous Communities (Bailie et al. 2002) and Wayte et al. (2007) emphasise the apparent lack of research and intervention in this area when compared with liquid waste.

Appendix: A Framework for future design of waste services, policy and product system development

Potential health issues are associated with every step of the handling, treatment and disposal of waste (Giusti 2009). Health impacts may occur following exposure to environmental hazards found in wastes. Waste is a complex mixture of different substances - only some of which are intrinsically hazardous to health (Rushton 2003). Figure 1 and 4, adapted from Saffron, Giusti, and Pheby (2003) illustrates the process by which adverse health outcomes may occur following exposure to hazards in solid waste. The elements of Figure 1 and 4 are further discussed in this report.
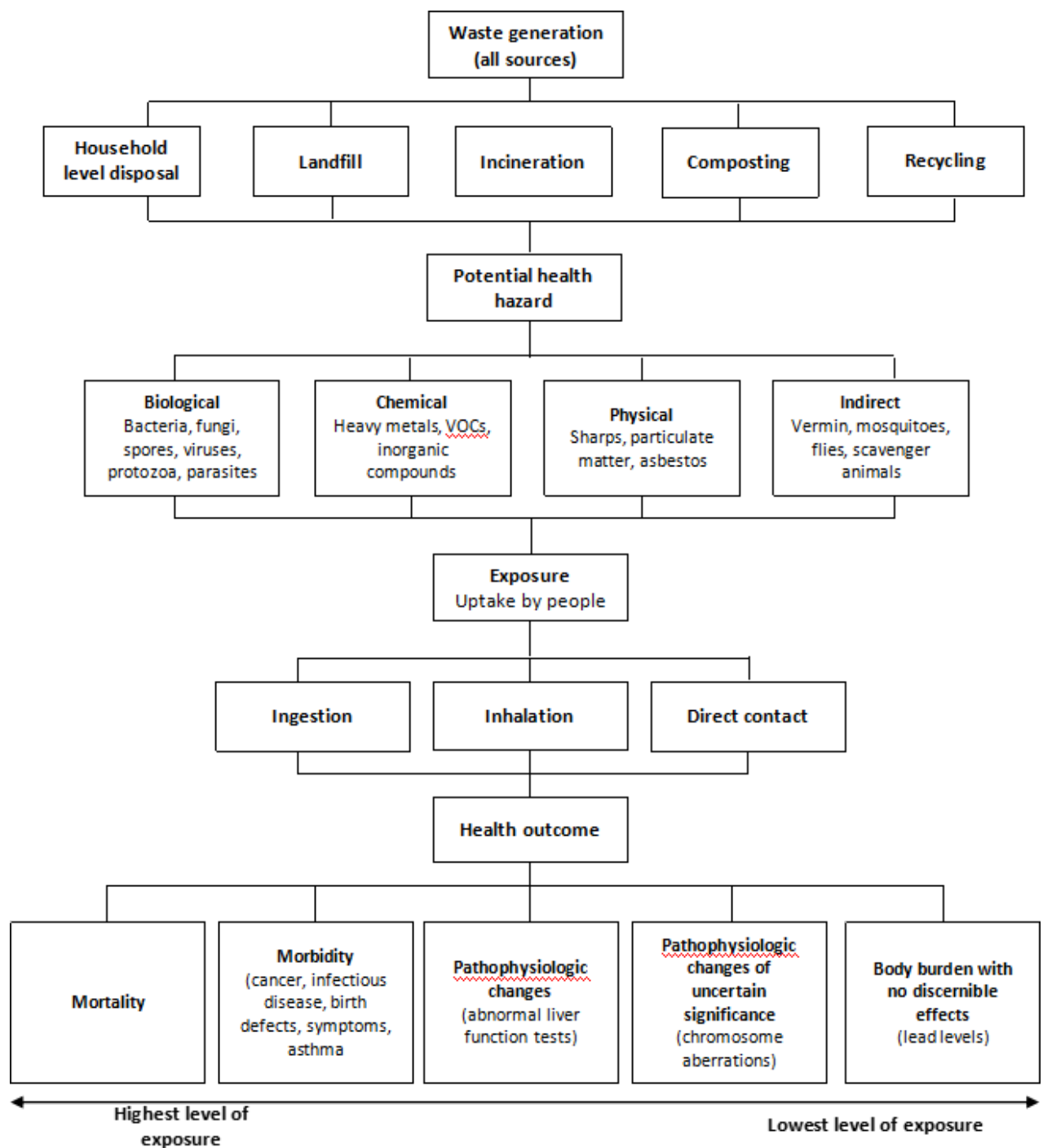
**Figure 1 Adverse health outcomes may occur following exposure to hazards in solid waste (Fig 1 is repeated as Figure 4 in main body of report with additional information**

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# Designing innovative wayfinding systems in healthcare: from exploratory prototyping to scalable solutions

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## Keywords

wayfinding, built environment, human centred design, strategic, healthcare

## Introduction

Wayfinding is a multi-faceted system that considers end-to-end user journeys beyond an environment. It is a strategic, multidisciplinary approach to user experience communication, often in context of the built environment. As such, good wayfinding is critical to successful navigation (Gibson, 2009). Poor wayfinding results in stress, anxiety, timeliness, and can negatively reflect on organisations and the services they provide (Mollerup, 2013; Passini, 1996; Golledge, 1992). In healthcare, wayfinding is regarded as a 'big box' solution due to its ever-increasing complexity and scale (Jones, 2013, p.xv). The emerging focus toward patient-centric solutions in this context means wayfinding is complex and multi-faceted, and when done well will underpin good future healthcare experiences.

In this paper, we explore the complexities and challenges when seeking innovative wayfinding solutions in a central city hospital. Through four wayfinding projects this paper discusses the benefits and compromises of different wayfinding approaches and explores the transition from exploratory prototyping to scalable solutions.

## Case studies

The Design for Health and Wellebing (DHW) Lab is a multi-disciplinary design studio embedded in a New Zealand hospital (Reay et al. 2016). The following four projects demonstrate the approaches, scales, levels of innovation and agency taken, illustrating the learning process of wayfinding as a discipline in the organisation (both by the lab team, and hospital stakeholders).

### 1. Adult Emergency Department

A wayfinding opportunity was identified to help patients more easily locate their consult room (Reay, et al. 2017). The solution was local to the context, and small scale. Consequently, it was quick to prototype a solution. Following positive feedback, the

solution filtered through the larger organisation and began to reveal an appetite to solve wayfinding and signage problems using the lab's in-situ capability.



**Figure 1. Adult emergency department door signage development, testing and installment (Reay et al. 2017).**

## 2. Children's Outpatient Department

Wayfinding issues were identified in a children's outpatient department. The potential to influence future change in the department was identified. Consequently, the project grew from responding to a specific, well defined problem to one that was more holistic and explorative. Large format temporary prototypes served as provocations, communicating what wayfinding could be when the end-to-end journey was considered (Short, Reay, and Gilderdale, in press). As this was an explorative project, staff engagement was difficult, despite stakeholder support.
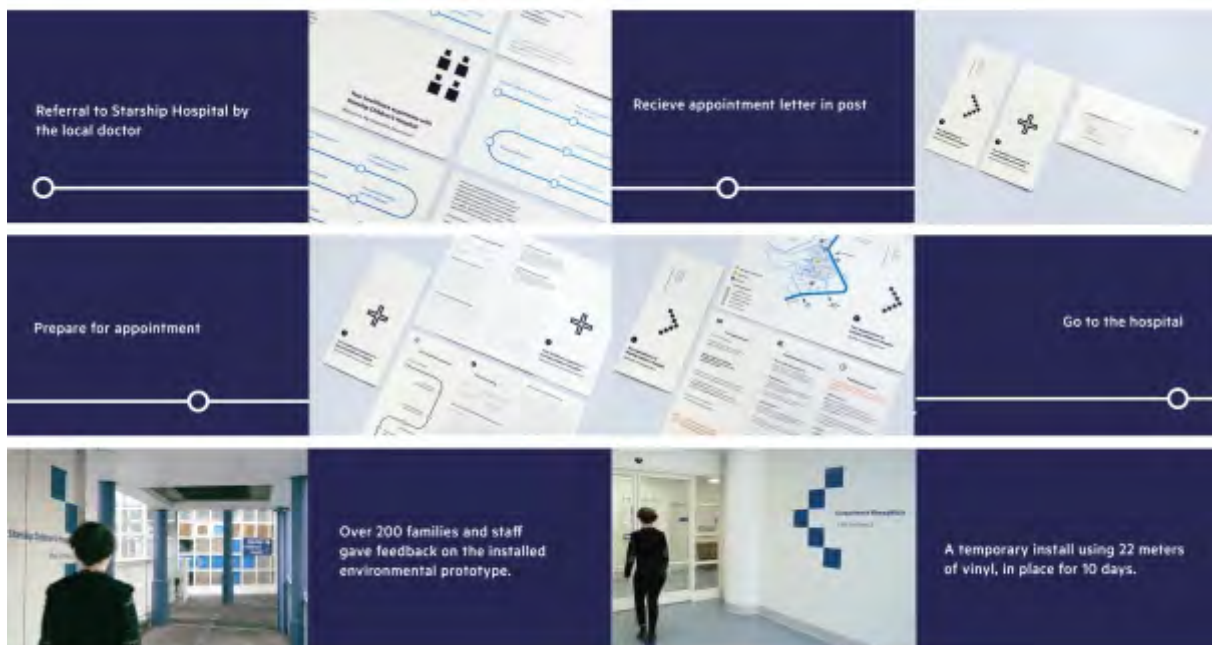


**Figure 2. Artefacts and process documents exploring a more holistic 'end to end' wayfinding solution for a children's outpatient department (Short, Reay, and Gilderdale, in press).**

# 1. Ward Wayfinding

A ward signage project was initiated to decrease the amount of time the ward staff spent giving directions, and was intended for a full role out across the hospital. The project was a local solution and scalable only within the context of a ward environment, yet the approach had significant campus-wide wayfinding implications. In response, the team created a visual document to communicate concerns regarding the broader wayfinding implications and made recommendations to stakeholders (Figure 3) that highlighted the need for coordinated, campus-wide approach to wayfinding solutions.



**Figure 3. Visual document communicating the need to consider a campus wide wayfinding strategy.**

# 2. Main Entrance and Public Space

An upcoming refurbishment of the hospital main entrance and connected public areas aimed to demonstrate commitment to patient-centered spaces. New wayfinding was identified as an area for improvement. As this was a large and complex project, external wayfinding expertise was engaged to collaboratively consider the strategic direction for

the entire campus site. The subsequent entrance wayfinding solutions were aligned with this strategic direction. Entrance solutions addressed stakeholder concerns for effective signage, and serve to demonstrate what future wayfinding could be for the organisation Figures 4 & 5.



**Figure 4. New wayfinding signage solutions for the main hospital entrance space.**

**Figure 5. A design guideline was produced and presented to stakeholders to gauge appetite for change, communicate campus-wide implications of projects, and demonstrate the need for a cohesive wayfinding system.**

A considerable effort was spent lifting the design literacy of stakeholders, so decisions were made with greater appreciation for the complexity of problems and the need for investment in coordinated change.

## Conclusion

Wayfinding should support broader health seeking journeys (Short, Reay, and Gilderdale, in press). Consequently, signage should be considered a last resort (Mollerup, 2013). However, the initial focus of these wayfinding projects were to develop new signs. This is in part due to signage being the most visible component of the wayfinding problem. Furthermore, 'signage' ownership is relatively easy to designate within in the organisation, as historically the responsibly for signage was held

by the internal facilities team. The holistic approach of wayfinding challenged the more traditional siloed nature of the hospital. By being solution focused a diverse group of stakeholders was brought together to better understand the complexities of wayfinding, and commit to solving the problem at a more strategic level.

Within healthcare (especially publically funded), cost is an important factor in decision making. It can be difficult for systematic change to be implemented due to the high cost and risks involved (Gressel & Hilands, 2008; Jones, 2013). Consequently, it may be unrealistic to expect high levels of investment, despite the breadth and impact of wayfinding problems on day-to-day operations (e.g., staff time directing people, late or missed appointments, and undue stress and anxiety on patients and families). Our approach attempted to work within these constraints.

The first two wayfinding projects, described above, began opportunistically to solve localized problems. However, these projects grew in scale and potential impact, responding to the organisation's need for a more accessible design resource. This resulted in the design team becoming embedded in a more strategic process to define and collaboratively contribute solutions to the hospital wide wayfinding problems.

The unique nature of the DHW lab initiative has provided an 'accessible' design resource for the hospital, allowing more opportunities to consider early design input without the bureaucratically more difficult (and more expensive) external design support. This drew attention to the implications of poor organisational design literacy. In this context, a key role of the design team was to demonstrate what design can offer, as well as to communicate the complexities of seemingly simple problems (i.e. redesigning signage), whilst contributing to growing more sustainable organisational design literacy.

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# Designing health information to an acceptable standard: the state of the art, science craft, and design

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## Keywords

Information-design, health, standards, design-process

## Introduction

Information design (ID) is concerned with making information easily accessible and usable by people. As professional practice, research domain, publishing, and university subject it is now well established and used routinely in a wide variety of organisations including government, finance, retail, utilities, and information technology. ID has also made some contributions to health, particularly in the design of consumer medicine information CMI).

Health is an information-dependent field. Wherever health provision is practiced, information provides critical links between researchers, professional practitioners, patients, and consumers, and can make the difference between successful and unsuccessful practice, sometimes between life and death. Sadly, the quality of health information is highly variable. Forms used to collect patient and treatment information can be difficult to complete and error prone. Treatment schedules and instructions can be misunderstood by professionals and patients alike.

A substantial body of evidence exists showing that applying professional ID practice to health information may lead to improvements in health outcomes. But improvement often depends on face validity. For example, the claim that improvements in medical information design leads to improved patient compliance has little direct evidence to support it. For health information design (HID) to really add value to health practice, it must aim higher than improvements. HID must aim higher, by setting agreed measurable standards of health information performance.

The research reported in this paper has gone some way to developing the methods for setting agreed standards in ID and HID that are acceptable to health professionals and consumers, achievable in practice, and measurable. When applied to HID, these standards can make a significant contribution to health outcomes and productivity.

## Standards in HID

Standards are agreed performance levels. They may rely on scientific measurement or on social convention, but the agreement must be determined by social processes:

regulation, legislation, stakeholder meetings, etc. Much is yet to be done, but well documented precedents exist to guide the development of HID standards. Two types of standards can be applied to HID: those increasing the likelihood of the information being used effectively, and those that support use. The criteria are set by matching people's expectations with the appearance and content of the information.

## Standards for avoiding the rubbish bin

People have developed formal and informal strategies for avoiding information. HID must counter these strategies by creating designs that make it less likely that information will end up as landfill. The five criteria for matching users' expectations are physical appropriateness, social appropriateness, credibility, respectfulness, and attractiveness. If standards for these criteria are not met, the likelihood of the information being used effectively by professionals is lowered, and of being discarded by consumers is raised.

## Standards supporting use

If people are to use information effectively, it must also meet four usability criteria: finding appropriate information, using it appropriately, and using it efficiently and productively. Although designers commonly refer to User-Centred-Design (UCD) and User Experience (UX) design, acceptable standards have not been proposed. ID, however, has specified standards with a full range of testing procedures for ensuring that particular designs meet or exceed these criteria.

This paper discusses the acceptable levels of all nine criteria, and how these standards can be measured.

## Processes in HID

ID has developed routine methods and ways of thinking that ensure professional practice can be replicated and its quality assured over a range of applications. Its practices draw on aspects of graphic design, typography, human factors/ergonomics, cognitive science, design methods, plain language, public communication campaigns, and the recently fashionable Design Thinking, to mention just a few.

The research reported here drew on these and other sources, but applied strict criteria to the inclusion or exclusion of routine methods, skills and knowledge. The criteria were determined by finding out what worked and which skills and knowledge contributed to measurable outcomes. Over 200 ID projects were undertaken in government, business, and health settings. The resultant methods constitute a mature set of professional practices that can be applied in many areas, including HID.

### A seven-stage process

The stages in ID scoping, baseline measurement, prototyping, testing &refinement, implementing, monitoring. This paper will define each of these and their interrelation.

# Key skills and knowledge

A mix of interdisciplinary skills are a vital part of successful ID. The traditional crafts of typography, graphic design, illustration, writing and editing are a prerequisite. Project management and stakeholder engagement are vital. The many projects that informed the development of the ID process did not suggest specific areas of knowledge or scientific research as a prerequisite to successful outcomes. The reasons for this are explained in the paper; however, first-hand experience in testing designs was a prerequisite for successful outcomes.

The paper discusses in detail the state of the art, science, craft and design of HID, and shows many examples of the work produced.

# Measuring outcomes

Key to the success of ID projects are the data collected at the baseline measurement stage, testing and refinement, and monitoring stages, The paper will present examples of data from actual projects that demonstrate this.

# Conclusion

An immediate research outcome from this work has been to select/reject specific ID criteria from published research to establish standards for HID. For the health industry to routinely achieve high standards of information might need work, but the fact that the 'laboratory' for this work was in the participating organisations is ground for optimism.

# Acknowledgements

No organisation had a controlling interest on the direction or outcome of this project. Nonetheless the author would like to acknowledge the contribution of the 200+ organisations that funded this work and the many individuals who contributed to this project's success. (The full list will be in the paper)

# Sharing the city: An intergenerational VR experience

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## Keywords

Aging, Ageism, Technology, Joyful Aging, Intergenerational Connection, Intergenerational interaction, Virtual Reality technology, Aging-well.

## Ageing and intergenerational interaction

As life expectancy increases, and with an increasing number of generations living at the same time, intergenerational interaction has become more common part of the process of 'ageing,' and what the term ageing means. However, this is not always represented in actual social interactions between generations. The perception and role of the older generation has also changed over the past 100 years with society becoming increasingly segregated (Robinson and Howatson-Jones 2014) and negative stereotypes of older adults are prevalent (Smirnova 2010). Due to the global ageing population, intergenerational understanding and connection has becoming increasingly important (Robinson and Howatson-Jones 2014). Evidence has shown that programs that enable interaction across multiple generations are beneficial for society and both parties involved (Brown & Henkin, (2014).

By facilitating intergenerational connection and understanding, we can help combat the stereotypes associated with ageing (Alcock et al. 2011) and encourage joyful or active ageing in individuals (Teater 2016).

Active ageing places the emphasis on transition between stages rather than being in one single stage and shifts from a needs-based approach to a rights-based approach (World Health Organisation 2002 ).

The focus of current technology design for older adults is typified by an approach which places the needs of older adults secondary to technology design and development (Durick et al. 2013). Looking at technology design for older adults from a lifespan perspective suggests that design should shift focus away from designing technologies for older adults and instead focus on inclusivity. The lifespan perspective emphasises that ageing is a constantly changing process that occurs across all generations. This perspective also suggests that we have the opportunity to create technological solutions that enhance unique individual experiences and a shared group experience (Durick et al. 2013).

Abeele & De Schutter (2010, 84) draw upon existing game design fundamentals to emphasise that designing meaningful games for users is key to successful game design and that meaning is linked to the "emotional and psychological player experience a game is supposed to create."

Hence current studies show that successful digital games designed for older adults should ideally have possibilities for self-expression, relate to the interests of older adults and be designed to play with other people rather than a computer.

Chua, Jung, Lwin, & Theng (2013) suggests that after regular interactions between members of different age groups playing digital video games across a period of two months, these people "tend to develop not only positive perceptions towards their particular play partners, but also positive general perceptions towards the members of the other age group."

If we can create a mutually beneficial program we can deliver an outcome that benefits both parties, enhancing their self-worth, mutually educating and breaking down stigma and intergenerational barriers. Hence, in this study we are focusing on is the design of games for the purpose of social interaction in order to bring generations together for shared experiences.

# The study on meaningful places and game development

**Aim:** Sharing Melbourne was a university-based project that aimed to produce a game that would bring generations together and facilitate a shared experience through technology. It was to be engaging, expressive and engender feelings of respect, enjoyment and interest.

In designing the game, it was important to ensure that the experience would be equally meaningful and of interest for the younger generation as well as for the older. By utilising innovative technology that is equally unfamiliar to the younger generation as for the older generation we ensured that the generations would explore the game together.

**Data collection:** Semi-structured interviews were conducted with participants between the ages of 19-30 years of age who were students at a local university and 65- 80 years of age who were members of a knitting group at a community centre. The emphasis of our design rested on providing a worthwhile shared experience for both parties by including locations which will resonate with people of multiple generations. Older adults named the following locations as meaningful places of past to present: Coles Cafeteria, The Red Rattler (Train), Myer Christmas windows and rooftop carnival, Flinders Street Station, St Moritz ice skating rink, Melbourne Town Hall and Melbourne Zoo. Events named were the 1956 Melbourne Olympics, 1954 Queen Visit, the Melbourne Cup and Royal Melbourne Show.

These results were cross referenced with answers provided by younger respondents. Younger respondents had difficulty pinpointing one specific inner-city location as having special significance as they liked trying out new places to eat and drink coffee. However, when prompted most respondents recalled visiting the Myer Christmas Windows and the Melbourne Zoo as children. Based on these results the Melbourne Zoo, and Myer Christmas Windows were selected as locations of shared experiences.

Also, importantly our young interviewees overwhelmingly reported that they did not have contact with the older generation other than family. They also reported that they

would take their elderly family somewhere out of the city or quiet if they were going on an outing.

**Concept phase:** The design of the Sharing Melbourne (3D) experience depicted the Zoo and the Christmas Windows as areas of Melbourne from the past and the present that are meaningful for older and younger users. This experience was screened in a 3D visualisation chamber with 3D glasses. The scenarios were designed in 2.5D in which 2D pictures and photos were layered in a 3D space to create a virtual reality depiction of what that location looked like during a particular era. These were accessible with a menu limited to four buttons on a x-box controller to select specific locations and times. Seats were placed inside the Virtual Reality Chamber to minimise dizziness and allow for frail users. The framework for the design of this game was based on insights from Sayago et al. (2015), who co-created games for the older generation by using their memories of place as the content for the games. This approach was found to be successful in creating a game that older individuals found meaningful and wanted to play. This game was produced and evaluated.



**Figure 1. Melbourne Zoo today**

**Figure 2. Melbourne Zoo in the 1940s**



**Figure 3. Use of the VR Cube during evaluation (left). Assets for Myer Windows- 1950's -1960's (right)**

**Figure 4. A shared scene from Myer's Christmas Windows past**

**Evaluation:** The evaluation involved testing the Sharing Melbourne (3D) experience with four female and three males aged between 65-80 years old during a public exhibition. Attending the event were a further five females and two males between the ages of 23-35. The experience proved successful in opening up conversations between younger and older individuals sparking conversations about the beginnings of television at the Christmas Windows, and riding on the elephant Queenie at the Melbourne Zoo; "You know, I actually rode Queenie in the 1940's!". and "I remember taking my children to the Myer Christmas windows every single year. Now I take my grandchildren." Younger individuals expressed interest in seeing the city in a different light: "Oh! Is that it? I want to see more of how Melbourne used to look like."

The fact that the scenario took place over an event also served to breakdown stereotypes of elderly people as "needing somewhere quiet and out of the city to visit" with one young person exclaiming "when I'm in my 70's I want to be like that, no! I want to be like that now."

## Conclusions:

While a small study this project shows that intergenerational interaction can happen in positive ways when meditated by unfamiliar technology, breaking down stigma and prejudice and lead to meaningful shared experiences.

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Figures 1, and 2: Zoo (past):

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# Reimagining ageing: Insights from teaching co-design methods with designers, seniors and industry partners

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## Keywords

Co-design, participatory design, education, problem-based learning

## Introduction

Interest in co-design is growing in the design literature, as is problem based learning in design education, yet little research exists on teaching co-design with real-world industry partners (Hanington 2007; McDonnell 2016). This leaves design educators wondering what is the influence of teaching co-design with actual industry partners on student learning. Two industry partners were invited to collaborate with seniors and multi-disciplined design students to redefine ageing. Both involved co-designing future assistive technologies. This study is significant as it is one of the few case studies trialing real-world briefs where design students and senior's co-designed prototypes to de-stigmatized images of ageing. The findings suggest combining co-design methods with real-world briefs offers an immersive environment for design students to learn and apply innovative strategies to propose impactful designs, in new complex domains. As designers are not experts in health, co-design methods give designers tools to leverage expert end-user knowledge to produce innovative high impact designs – hence opening up new work domains.

In recent years, there has been an evolution within health care that has seen many devices and services that were once confined to medical locations expand into homes, where the aesthetics do not suit the home environment (Bitterman 2011; Botero and Hyysalo 2013). Seniors wanting to live independently in their own homes, in need of home modifications and assistive technologies, are often faced with designs that are stigmatising and consequently not used. However, elegant and appropriate design while appreciated in this domain is rare. There is a need for designers to fundamentally re-imagine ageing, address negative stereotypes and redesign a positive ageing landscape (Coleman 2015; Dankle 2017; Hirsch et al 2000).

## Method

Two industry clients briefed masters' students on the complexity of designing products for ageing, challenging the students to design elegant solutions, delighting seniors. An ageing expert briefed the students on issues associated with designing for seniors critically analysing previous failed medical devises. The students devised a range of co-

design activities to apply at four workshops, following an iterative process of designing and refining ideas with several weeks in between for reflection. Six seniors, five design academics, and 24 multi-disciplined design masters' students took part in the workshops. Two note takers recorded the workshops' conversations and photographed the outcomes. The data was compiled into a chronological case report and thematically analyzed. All participants completed a reflection questionnaire and insights were sorted into to four perspectives.

# Results

**Design Students' perspectives:** The students were thrilled to learn professional skills and co-design end-user research methods. Several were pleased by the excellent standard of their own outcomes. Three students expressed surprise by how different a co-design process is from intuitive design. Several were excited by the thought of continuing working with co-design methods into the future.

**Seniors' perspectives:** The seniors appreciated being involved and were impressed with how much time the students had put into reframing ageing. Two seniors clearly didn't just want to talk about their needs, they wanted to give back and feel useful. Many joked with the students that life throws you curve balls, urging them to start preparing for unexpected life events. For example, once visible signs of illness appear you are stigmatized and unable to work and earn money.

**Industry partners' perspectives:** Our clients' expectations of the students' design work were exceeded. One client offered to mentor several of the students to commercialize their ideas into the future. Both clients and our ageing expert agreed that the students' design outcomes were highly innovative through user involvement via co-design compared to design-led only processes. For example; the clients had been working for many years with ageing assistive technologies and were delighted with three of the co-designed solutions 1) a grab rail concept that solves the slipping hazard of metal grab rails when wet; 2) a community ageing health forum called 'we care; we share; we connect; we live well'; 3) a futuristic walking stick, featuring a torch, a GPS help button, and an alarm.

**Design educators' perspectives:** As educators, we acknowledged the extra time and effort to arrange co-design collaboration in classes, where adopting a flexible, 'follow me' coaching style of teaching is necessary to overcome the complexities that arise. Balancing student learning with industry expectations was also a challenge.

# Discussion

Many design educators prefer hypothetical briefs over real-world briefs due to the complexities of involving clients in the classroom (Roberts 2004). We show that confronting real-world project constraints and listening to the end-users' views sparked creative outcomes and enhanced student learning. While co-design is acknowledged to be useful for designing appropriate products for end-users some doubt it's value believing that designers creative inspiration will be ruined by the complexities of having to include end-users' views (Large 2001). Our findings dispel this myth, as the design outcomes produced were deemed innovative by our industry partners. While some

designers acknowledge that their co-design projects have failed to achieve an outcome at all due to co-design's inherent complexities (Lundmark 2017), we show that outcomes are achievable with co-design. In fact, combining co-design processes with real-world briefs helped steer the students through the layers of complexity to achieve inspired design outcomes.

# Conclusion

This study shows that involving end-users in real-world co-design projects in tertiary education leads to excellent design outcomes and student learning opportunities despite the complexity of the problem. Real-world co-design briefs influenced design student learning positively in the following ways: 1) Students learnt new evidence-based design skills giving them freedom to creatively express themselves based on actual preferences of seniors, realizing intuition has its limitations. 2) Students gained confidence that their designs would suit the seniors' needs, and they learnt client and project management skills; 2) Seniors shared their expertise with the young designers, contributing to their education; 3) Industry partners mentored and created partnerships with the young designers and found innovative design solutions worth commercializing. The small scale of this study is a limitation. The implications of the findings suggest it is worth lecturers' time to invest in co-design with real-world industry partners. We argue that combining co-design processes with real-world industry partners helps students navigate complex project demands, achieving innovative design outcomes that de-stigmatize medical devices for seniors.

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# Taking the pulse: A survey of design for health development in Singapore

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## Keywords

Design for Health, Singapore, State of Development, Education.

## Introduction

The field of design for health in Singapore is in its nascent stage of development. However, awareness and interest towards investigations at the intersection of design and art, health and well-being appear to be gaining traction. The emergence of several activities and initiatives in recent years among design and art practitioners, policymakers, and stakeholders in the healthcare, social care, and education sectors, indicate growth of activities in design for health. What are some of the recent design for health initiatives? What is the state of Design for Health development and education in Singapore? What might be some of the considerations to further develop and grow the field? This presentation provides an overview of activities currently shaping the field of design for health in Singapore. The first section will first highlight several recent initiatives before introducing a range of design for health explorations occurring at the School of Art, Design and Media, Nanyang Technological University, Singapore. Lastly, this presentation will conclude with a discussion of plans at the Art and Design for Health Lab (AD4HLab), a new initiative at the university that aims to support and grow design for health explorations and capability development in Singapore.

## A growing consciousness and appreciation towards Design for Health

Although the field of design for health in Singapore is less formalised than other international counterparts, such as the UK and the US, the island republic is not short of innovations at the nexus of design and health. The emergence of initiatives in recent years, such as the inaugural Design and Health Asia Pacific 2013 International symposium and exhibition, the launch of the Design2025 master plan, and social design initiatives led by the DesignSingapore Council, indicate a growing consciousness and appreciation toward the role and value of design in health.

The DesignSingapore Council (DSC), a national agency for design formed in 2003 to encourage and support the use of design for business growth, nurtures local design talents and innovation, as well as promotes Singapore Design. A key thrust of DSC is to use design to contribute to social progress. For example, following the launch of The Design 2025 master plan in March 2016, which aims to use design to engage and address complex societal problems, DSC launched several initiatives to encourage a process of

people–centred design that can be useful to improving and shaping safer and more inclusive community living. These initiatives include:

- The Better Life by Design, a social innovation project that aims to innovate and reimagine the nation's social services and bring improvement to the quality of life for People with Disabilities (PwDs), involving people with physical, intellectual, visual impairment, hearing loss, or autism spectrum disorders. PwDs' caregivers and stakeholders from public service, healthcare, and social service sectors also participated in and contributed to the research;
- "AccessAbility" and "Design for Dignity" (2016), a two-part exhibition-seminar event organized by The Embassy of Sweden and the Swedish Institute, in partnership with DesignSingapore Council and the National Council for Social Service. This event explores how design can increase accessibility and promote independence for people with disabilities;
- Designathon (2017), a collaborative and networking platform launched by DSC DesignSingapore for designers, developers, entrepreneurs, students, healthcare workers, and social service providers to collaborate on identifying design solutions for people with intellectual disabilities, autism spectrum disorders, sensory (sight or hearing) disabilities, or physical disabilities in Singapore. Although the aforementioned initiatives may not target health specifically, they provide indication of increased interest in deploying and engaging design to improve quality of life and promote inclusiveness.

## Redefining Hospital Designs

The design of a hospital's physical environment can positively affect patient outcomes by promoting recovery and shortening the length of stay (Devlin and Arneill 2003, Ulrich 1992). Another indicator for the growing consciousness and appreciation for design for health can be found in the designs of the two newest public hospitals in Singapore: Khoo Teck Phuat Hospital (opened in 2010) and Ng Teng Fong General Hospital (opened in 2015). Drawing upon the understanding that encounters and visual contact with greenery promote relaxation (Grinde and Patil 2009), both hospitals incorporated lush greenery into the hospital environment to optimise patients' exposure, thereby providing a comforting environment for convalescence. Viewing the outdoors can have a positive influence on recovery and promote restoration (Ulrich 1984, Kaplan 2001). In these two hospitals, every bed has a window view. Also taking into consideration to the importance of privacy to the physical, mental, emotional, and spiritual well-being of patients (Woogara 2001), these new hospitals have adopted a fan shape layout for its multi-bed wards. The staggered bed arrangement afforded by the fan shape layout enhances the privacy of the patients by creating enclaves that partially obscure the patient from view.

Besides fostering a healing environment, the newest public hospital, Ng Teng Fong General Hospital, prides itself on several patient-centred innovations, environment, and service design. The patient-centred innovations aim to provide a seamless service that address and support the needs of patients at various stages of their recuperation. Some of the notable innovations include:

- The Mobility Park, a patient rehabilitative facility that equipped with features that stimulate public transport settings and disability friendly facility such as ramps to enable the patients to re-adapt to their daily lives. The park, shown in Figure 1, is the first of its kind in Singapore designed to support patients' recovery process;
- The Arts & Health Programme, steered by an art advisory committee, has introduced a variety of art engagement programmes and commissioned art project to help create a relaxing, engaging and caring healing environment such as commission artwork projects for the Intensive Care Unit. The hospital is also the first to actively consider and incorporate Arts for health as a part of its service delivery



Figure 1. The Mobility Park at Ng Teng Fong General Hospital

# Nurturing Design for Health Capability

There is currently no formalised education programme that focuses specifically on design for health in Singapore. The School of Art, Design, and Media at Nanyang Technological University is an advocate for this field. Exploration at the nexus of design and health has been encouraged and supported via: (a) independent study approaches in the form of final year projects (FYPs), (b) supervisions, and (c) the URECA Programme, an undergraduate research programme for top performing students to undertake independent research. Some of the examples of design for health projects by students include:

Sensory Pizza, a therapy tool developed in collaboration with Occupational Therapists, for use during sensory therapy for Children living with Sensory Processing Disorder (SPD) (see Figure 2).

- *The Great Hospital Adventure in Space*, shown in Figure 3, is an illustration

  book project that facilitates communication of medical procedures to

  children.

- *Rabbit-Ray*, shown in Figure 4, is a paediatric education device developed by Esther Wang, a Product Design Undergraduate. The device enables medical professionals to explain medical procedures to children through play. Following further development by Wang upon her graduation, Rabbit Ray is now used by leading hospitals across five countries including Johns Hopkins Children's Centre (USA), Great Ormond Street Hospital, Evelina London Children's Hospital (UK) and National University Hospital (SG).



**Figure 2. Sensory Pizza: Therapeutic application of Surface Design for Children living with Sensory Processing Disorder by Chong Tong Pei.**



**Figure 3.** *The Great Hospital Adventure in Space*, **an illustration book project by Serene Ng Wei En.**

Figure 4. *Rabbit Ray* by Esther Wang Chun Shu.

More recently, a group of URECA students collaborated with Ng Teng Fong General Hospital to develop engagement tools for staff and hospital volunteers to use with patients.



Figure 5. Hospital Volunteers trying out Engagement Tools by URECA Students

# Conclusion

While the field of design for health in Singapore is in its nascent stage of development, the various activities highlighted in this presentation illustrate the growing awareness and interest towards investigation at the intersection of design and art, health, and wellbeing. As an effort to further develop and promote exploration in this area, the School of Art, Design and Media at Nanyang Technological University has recently established an initiative, the Art and Design for Health Lab (AD4HLab) to promote creative art and design research for the promotion of health and well-being of individuals and communities in various settings. AD4HLab aims to:

- Promote exchange and collaboration among practitioners and researchers in the arts, design, humanities, health, medicine, and other related fields to explore the potential of creative practices and design strategies to improve experiences, services and product for health and wellbeing.

- Connect with end users and community partners to co-create innovative approaches and outcomes that provide insight or address health and wellbeing issues and challenges in various settings.
- Develop capability and scholarship in art and design for health through project supervision and workshops.
- Promote networking and build relationships with local and international institutions, organisations and individuals working in this dynamic area of interdisciplinary research.
- Develop resource to support and facilitate research, practice and education in art and design for health and wellbeing.

Some of the short-term goals of the AD4Hlab include to grow relationship with partners in the health and social care sector to explore project partnership. It also aims to engage the DesignCouncil Singapore to explore ways to help further develop capability in this area. Lastly, to promote exchange with international colleagues in the field, the initiative looks forward to hosting an annual conference to promote awareness in the Asia region and encourage contributions from the region.

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# Framing food literacies: Reflections from two Australian design-led innovation projects

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## Keywords

Teacher education, STEM, Technacy Genre Theory

## Introduction

Science, Technology, Engineering and Mathematics (STEM) education has been identified as a keystone multi-disciplinary strategy for developing in students *critical and creative thinking, problem solving and digital technologies, which are essential in all 21st century occupations* (Education Council 2015 p. 3). Furthermore, an expectation for schools and education systems is to design effective teaching and learning content and assessment resources that support this initiative. It is important to realise a limitation of many technology oriented frames used in schooling is often formulaic (Ballantyne-Brodie, Wrigley, Ramsey and Meroni 2013). A risk with such approaches is that assessment is tightly bound to a rigid process that offers very little scope for students to understand the form of the knowledge and practice being studied. Therefore, there is a need for a set of guiding principles within the STEM framework that is capable of bridging the elements between Science, Technology, Engineering, and Mathematic disciplines.

This research puts forward a construct that is both rational and useful for identifying forms of STEM knowledge and practice that scaffolds the teacher to ensure the intellectual structures remains faithful to the disciplines. Technacy Genre Theory (TGT) offers a new schema for STEM education that is robust and capable of clarifying and classifying the foundational elements of distinct disciplines that serve as the connecting glue for each discipline (Turner 2013). This research offers new and exciting epistemological as well as pedagogical possibilities in planning school based projects and structuring assessment. Two case studies are presented as examples undertaken with primary schools in NSW Australia.

## Who will benefit

Primary and secondary school teachers, higher education practitioners and curriculum developers.

## Relevant background review

The National STEM School Education Strategy endorsed by the Education Council (2015) has implemented initiatives that require teachers to be cognizant on how to teach and assess students' multi-disciplinary learning. The goal is not to discourage or dispute the value of any mode of understanding, but rather to point to the different epistemological

requirements and expectations that they impose across different disciplines (Nikitina 2006; Stohlmann, Moore and Roehrig, 2012). Furthermore, school teachers from pre-school to higher education will be required to deliver inspirational course content to their students so that a progression of STEM learning acts as an enabler for all students to achieve their full potential according to their learning stage levels. The Education Council (2015) asserts that course content and assessment should be curiosity-driven through problem-based learning. Therefore, a significant shift is required in relation to the structures school systems have been operating within for decades in order to embrace STEM pedagogy practice.

However, Williams (2011) points out the rigid structure of secondary schooling negates a successful cohesive integrated STEM curriculum given the current discipline arrangement. This is compounded with staff that may be very resistant to change given their protracted connection to their preferred discipline. Williams also asserts STEM curriculum goals are "broad and undefined" (p. 27) coupled with outdated teaching methodologies, teacher efficacy issues and timetabling and resourcing constraints. In particular, there is a school-wide culture of "inflexible assessment" and its usefulness is questionable (Ministry of Education New Zealand 2012) as assessment differs in context and purpose across schools from different countries and therefore presents different meanings (Hartnell 2013). Coupled with assessment involves "the context in which the learner is situated and the context of the particular school subjects" (Hartnell 2014, p. 67).

Technacy Genre Theory (TGT) offers a framework for identifying inter-relationships and differences between different forms of technological knowledge and practice. TGT is an empirically tested method that is context and purpose specific, qualified through three key elements that exist in any technological activity (Turner 2013):

- *Human agency*: knowledge, techniques, organisation, social conditions and structures;
- *Materials and ecology*: materials or data and the environs in which these are sourced
- or manipulated;
- *Tools and equipment*: appropriate discipline choices according to the materials or data.

# Scope of the problem

## Methods

Participant teacher data was collected through a survey instrument pre- and post a workshop and integrated studies program.

TGT was used to frame two separate design led innovation STEM projects on food literacies.

- Context 1: Aboriginal and Torres Strait Islander (ATSI).

- Context 2: Sustainability and climate change.

Participants attended two separate workshops on STEM framing, planning and assessment. The workshops fed into the design of a school term Unit of Work.

**Project Context 1:**

Purpose: Enable community engagement between local Aboriginal Elders and teachers on authentic ATSI food literacies:

1. Science: Indigenous science knowledge and practice (Human agency);
2. Technology: Nature journaling (Tool/equipment);
3. Engineering: Indigenous food systems (Material/ecological);
4. Mathematics: Graphing and measurement (Material/data).

**Project Context 2:**

Purpose: Engage teachers in authentic learning experiences on food sustainability and climate change literacies:

1. Science: Western science knowledge and practice (Human agency elements)
2. Technology: Digital microscope and robotics (Tool/equipment elements)
3. Engineering: Biotechnology food systems (Material/ecological elements)
4. Mathematics: Graphing and measurement (Material/data elements)

# Results

The survey instrument documented teacher understandings and measured attitudinal change pre- and post-workshop and integrated studies program. The research identified changes in teacher knowledge on STEM framing, planning and assessment.
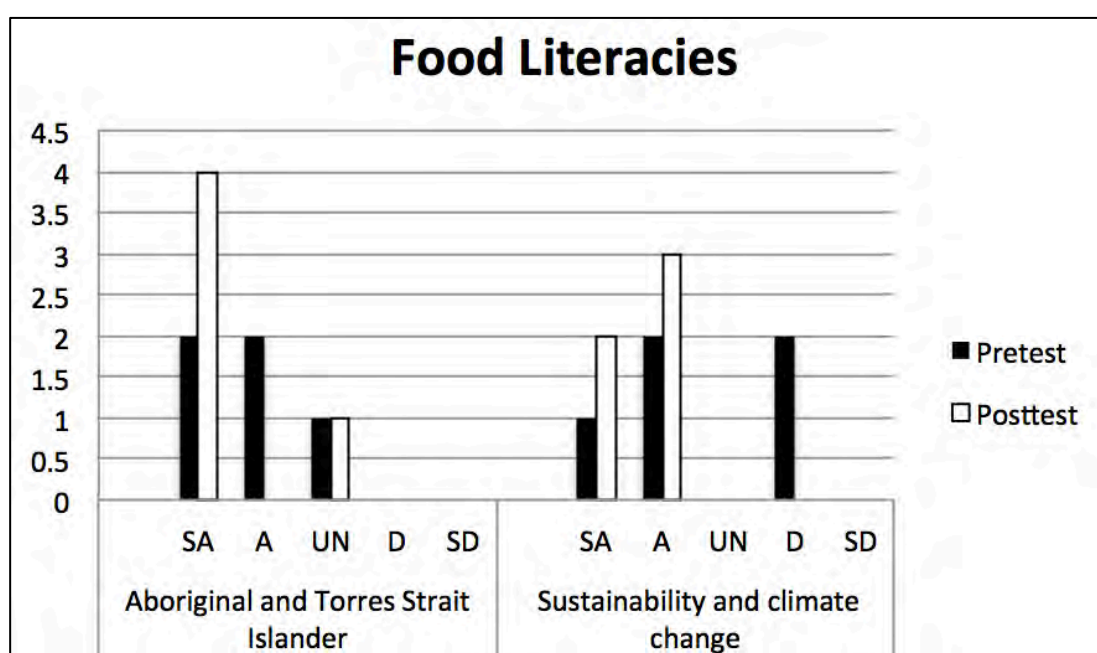
## Limitations and implications of the study

The researcher recognises there may be a degree of subjectivity involved in the synthesis of findings given the small number of participants (ten teachers). These were pilot projects with the future aim to expand the research to a larger collegiate of schools.

## Significance of research

While literature on STEM commonly emphasises purpose, goals and interconnected elements such as education, knowledge, innovation and influence, developing a common frame of conceptual understanding on the bridging elements between Science, Technology, Engineering, and Mathematic disciplines is weak. TGT is transferable to any research seeking to identify, clarify and develop various forms of technological knowledge and practice across STEM learning contexts. This is critical for authentic project planning efficiencies and assessment. TGT will benefit educational and technical professions by enhancing the quality and rigor of knowledge and practice for multi-disciplinary pedagogy.

## Conclusion

The diverse ways education policy seeks to conceptualise multidisciplinary pedagogy suggests that while we may see intuitively aspects of STEM disciplines containing some synergies, we equally struggle to clearly articulate it all into one whole universal model.

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# Research-led Design of a Communication Strategy for a Health Accelerator Program

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## *Keywords*

*Health accelerator, communication design, health care, innovative design*

## Innovation in the hospital

Organisations cannot survive without creativity and the world is moving too fast for them to rely solely on linear processes when developing new ideas (Kay, 2015). However, with such rapid and unexpected progress comes the possibility for adverse outcomes if not met with the necessary precautions. When posed with the problem of facilitating acceptance and understanding between clinicians, nurses and eHealth industry, it becomes important to understand how to create engagement between the different parties, consider the challenges that may present themselves, and in doing so promote the successful adoption of new technology in a hospital setting while fostering creativity.

## The health sector and technology adoption

The healthcare field is one of relative rigidity; strict rules and regulations that attempt to govern and mitigate risk to human life through medicine, surgery and consultation amongst other forms of care. An assembly of regulations binds these practices and services insofar as they should cause no harm. It should then come as no surprise that acceptance and adoption of new technologies in the healthcare industry is fraught with challenges as a result of regulatory and clinical hurdles (Davey, Brennan, Meenan and McAdam 2010, 22). For a new or unfamiliar technology to be adopted it must go through a process to demonstrate its safety and efficacy in the field. This often "slow, arduous process" (Davey et al, 2010) is one of the challenges to facilitating the adoption of new technology. The stakeholders of the healthcare and hospital sector, whether they are physicians, nurses or administration, have different views and rates of technological acceptance. The different levels of knowledge of these groups compound the issue by creating an "asymmetry of information" (DeMonaco and Koski 2007, 32). Physicians have a deeper understanding of the medical field but have less knowledge about the benefits of technology; nurses similarly understand healthcare but have a greater importance on patient interaction. The fundamental role of a nurse is to "assess patients and provide safe and effective care" (Ansell, Meyer and Thompson 2015, 886). The asymmetry coupled with a lack of communication is one of the greatest barriers to technological acceptance in this industry. Without proper implementation new technology often results in a failure of stakeholders to adopt the system, reverting to

previous endeavours (Edmondson, Bohmer, and Pisano 2001). There are many social factors within the work environment that can affect workplace creativity. Some key factors include the level of employee participation, employee perception of the organisation and the level of work group/managerial support (Schepers and van den Berg, 2006; Xerri and Brunetto, 2013; Chong and Ma, 2010). As a result of a culture and work ethic that is rooted in the use of face-to-face interaction and touch, the use of technology has implications that directly contrast the doctrine of the profession by removing nurses from this interaction with patients (Ansell et al, 2015). Adding further to this issue is the fear many nurses have about learning a new system or process (Turner 2016), often as a result of technological inexperience as an older workforce. All of this colludes to form an industry which is often the last to adopt technological innovation and difficult to inspire behavioural change (Escobar-Rodríguez, and Romero-Alonso 2013). This research clearly identifies the need for organisations to be creative and innovative in order to be competitive however, the question of how to optimise collaboration and innovation within a necessarily structured work environment has been largely overlooked. As asserted by Aktharsha and Hussain "management should ensure that nurses have time, resources and opportunities to engage in knowledge sharing" (2012, 22). Putting a program in place that educates and trains the staff within a hospital about new technology, not only does it insure that it is successfully integrated into the workplace, but alleviates any uncertainty or fear that staff may have (Turner 2016).

## Research process

The project was a collaboration between Melbourne Health Accelerator and Swinburne University of Technology to investigate how communication and digital media design could engage and encourage medical staff from the Royal Melbourne Hospital to participate in a health technology accelerator program. In order to inform design decisions and create meaningful, evidence-based solutions, a combination of research methods was required. The team's research spanned the entirety of the project and began with a review of literature including topics such as fostering creativity within workplaces, issues surrounding knowledge sharing within hospitals, and rules and regulations governing the health sector. Using key insights from the secondary research as a catalyst, the team conducted a wide array of primary research which included observational research, site visits, expert opinion interviews with an interior architect and the hospital's archivist, as well as running focus groups with different potential stakeholders from the healthcare community. Knowledge acquired from the secondary literature, in conjunction with an in-depth research analysis, allowed the team to conceptualise and implement a range of design solutions to address the challenges identified throughout the course of the project.

## Research results and outcomes

Results confirm that the hospital is an extreme complex and conservative environment and the introduction of new technologies is a challenge. In addition, it is difficult to receive design input and feedback for health technologies from health professionals, due to major time constraints. Even within the hospital itself many tasks and an abundance of information are permanently competing (see figure 1). Hence to draw

attention to this 'in-house' initiative a communication strategy was developed including a strategy to distribute and place communication within the hospital.
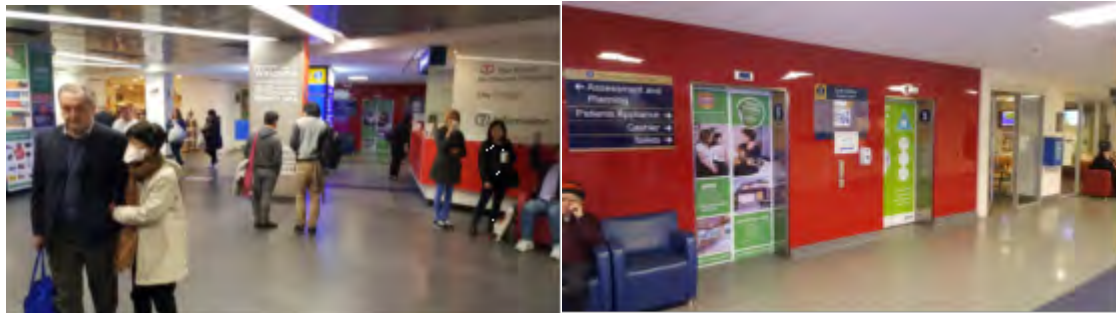


**Figure 1. Competing information throughout the hospital**

These solutions included an interactive display to encourage clinicians to share personal experiences and insights, a call to action poster series (refer to figure 2), a video (figure 3) and additional print collateral to promote and create an awareness of the program. Our final communication strategy explored interior floor plans and made recommendations regarding the spatial layout of the accelerator program informed by the interviews and Lamb and Shraiky (2013) who found out flexibility to modify the features of a defined space with movable furniture and walls being conducive to collaboration.



**Figure 2. Poster series to draw attention to the Accelerator program using historical photographs**

**Figure 3. "You are innovative"—video (still image)**

The short video features the same imagery used throughout the poster series, creating a visual unity between the artefacts so that the viewer recognises a connection between the posters and the flyers. The video is a call to action directed towards nurses and doctors based on the hospital's rich history and, ending with a tag line and the location of the space. By having the consistent visual theme and information everywhere in the space, a brand was created for the project. This, in turn, added recognition and value to the accelerator space. With the video displayed on the monitors all across the first floor of the hospital, and the posters on the walls, there was a variety of points of contact for our communication strategy.

# Concluding comments

This paper has highlighted main challenges identified in the health care sector to create a discourse about innovative technologies. The Health Accelerator as a concept situated within the work environment of the hospital staff and a communication strategy based on research were crucial in initiating this conversation between health care practitioners and health technology start-ups. Expanding the communication to involve patients in future implementations of the program will be of great value, as patient experience assessments contribute to transparency in healthcare quality (Ossebaard and Van Gemert-Pijnen 2016), which "[maximizes] the positive benefits and [minimizes] the negative consequence of such initiatives" (Pillemer et al. 2016, 8).

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# Making better use of recorded patient experiences: transforming literature into a collaborative tool for inspired interaction

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## Keywords

Co-design, health-data, patient-experiences, card-tool

## Introduction

Health services are working towards patient-centred care with a focus on patient experiences, as they are linked to patient outcomes, safety, clinical effectiveness and meaningful health interactions (Locock et al. 2014; Ahmed, Burt, and Roland 2014; Coulter et al. 2014; Doyle, Lennox, and Bell 2013). Current health design approaches place value on collecting primary data on the health experience of patients (The King's Fund 2013; Waitemata District Health Board 2010) and often overlook the value of existing data. A wealth of empirical data about health experiences exists in the literature, that could help designers and decision makers to understand people's experiences of health. Public expectation is that research is collected and shared to maximize value and enable translation of data into health improvement (Ziebland et al. 2014; National Health and Medical Research Council 2016). Researchers have proposed that not using collected experience-data is wasteful and unethical (Coulter et al. 2014; Garside 2013). This research data is almost exclusively reported in the traditional research report format, which limits its audience and is not practical to use in creative projects, such as co-design. Therefore, the potential value of the health experience literature in the design process is not realised.

## Objective

The aim of this research is to explore a method that reviews health experience-data and transforms it into a usable tool for the design process. Specifically, to inform designers and decision makers about people's health experiences. This format must be appropriate and accessible, must maintain the rich details and not stereotype the users or their personal health experience.

## Methods

A two-part research through design approach was employed to test the method of transforming health experience-data into a usable tool.

## Part 1

A scoping review was conducted and the insights were developed into a card-tool. The scoping review framework of Arksey & O'Malley (2005) guided the collection of qualitative research, exploring the experience of living with diabetes and preventing complications in Australia. The data was analysed through a process of affinity diagramming to identify insights into the health experience. These insights were developed into a card-tool, the Health Experience Insight Cards: Living with Diabetes edition. Each card communicates an insight identified from the review, into how Australians with diabetes experience diabetes.

## Part 2

The card-tool was tested in a co-design workshop focused on prevention of diabetic eye-disease with participants who had relevant professional experience. In the workshop, participants were invited to play a game with the Health Experience Insight Cards, using storytelling (Quesenbery and Brooks 2010). The stories were communicated using a combination of sticky notes and business origami, a technique where paper cut-outs are used to create physical representations of actors, artifacts and environments (Martin and Hanington 2012). The game format was chosen so that it could provide a "tangible and interactive simulation of knowledge from a specific domain" (Valente and Marchetti 2015, 137), engage participants and foster an informal, creative environment for interaction (Brandt 2006). With ethical approval, the workshop was recorded using audio and photographs.

## Results

## Part 1

The review identified 13 papers that fit the selection criteria. These were analysed to develop the Health Experience Insight Cards: Living with Diabetes Edition. The card set takes over 135 pages of existing health experience literature, transforming it into a card deck of 85 cards, which communicate a set of key insights developed from the literature. The cards (Figure 1) feature high-level insights at the top, followed by a detailed summary and a relevant quote from people living with diabetes in Australia. At the bottom of each card is a reference back to the original literature that contributed to each insight.

**Figure 1. The Health Experience Insight Cards: Living with Diabetes Edition**

## Part 2

Six participants, separated into two groups, took part in a co-design workshop where they used the cards to develop stories and learn from the literature. Interaction analysis of the workshop highlighted how the Health Experience Insight Cards inspired interaction. Three specific interaction categories were identified: (1) applying the insight from the card to the character/story, (2) discussing real life and (3) discussing experiences. The cards enabled the group to develop an in-depth personification of their characters based on the literature. Parallels of the storylines and the original literature demonstrate how the discussion was grounded in the empirical collections of patient experiences.

## Discussion

The scoping review identified valuable experience-data to inform designers about the experience of living with diabetes. The results are limited by the breadth of the search, search terms and the existing research. Nevertheless, the results are a valuable starting point for health improvement and collated the experiences of over 300 Australians with diabetes.

The cards engaged workshop participants in a process of understanding the data through the game. They triggered discussion about the insights from data, allowed participants to discuss real life and people's experiences. Further investigation into other ways to utilise existing literature in the design process and exploration into other uses for the Health Experience Insight Cards could be conducted. The cards could be used to inspire ideation, expand on existing concepts or critique concepts.

## Conclusion

This study shows a practical and ethical method for transforming health literature into a card-tool, to overcome the resource limitations of health design projects and enable

healthcare improvements. The cards have the potential to be used in future health-improvement projects for diabetes and the method could be applied to other health conditions or experiences.

## Acknowledgements

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# Designing for health beyond healthcare: From the institutional assumption to community health design

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## Keywords

design, public health, disease prevention, social determinants of health, social innovation

## The project

Public health, disease prevention and the improvement of wellbeing are among the most pressing and complex challenges facing society today. In this vein, it is well recognized that medical care contributes to only a small proportion of overall health; by most accounts between ten and fifteen percent of individual health outcomes (Heiman and Artiga 2015; McGovern et al. 2014). Factors such as income, immigration, racism and housing, known as the social determinants of health, are noted as particularly influential (Wilkinson and Michael 2003). Social determinants of health are multi-causal, interrelated, and integral aspects of the community that hold indeterminate risk, but are typically not perceived as health threats by individuals (Jones 2017). Nonetheless, communities require tools and resources for effective action on the social factors influencing wellbeing (ibid).  In light of this challenge, alternative approaches for realizing systems change are being sought by policy makers and healthcare practitioners alike (Carey and Crammond 2015).

Increasingly, design is being recognized as a powerful approach to transformation and catalyzing systems change within health and care (Aguirre and Vink 2013; Carr et al. 2009; Freire and Sangiorgi 2010; Jones 2013). Embedded design initiatives are popping up in healthcare institutions all over the globe including, for example: Hospital Italiano in Buenos Aires, the Mayo Clinic Center for Innovation in Rochester, Helix Centre in London, Experio Lab in Sweden, and the Design for Health and Wellbeing Lab in Auckland. Design is well-known for being person-centered, holistic, and re-framing problems through its approach (Dorst 2011; Stickdorn and Schneider 2010). At the same time, the context and positioning of design initiatives influence the resulting changes that are carried out (Design Commission 2013). While healthcare design initiatives are typically committed to thinking about peoples' daily experiences related to health and care, many of the solutions emerging from embedded initiatives remain closely

connected with the medical institutions they are created within. Organizational mandates, funding silos and resource allocation seem to play a major role in defining the focus of health-related design initiatives.

Thus, several questions arise: can healthcare design initiatives aid in addressing the social determinants of health? Does embedding design processes in medical institutions diminish design's potential to address issues of public health and disease prevention? These questions are closely connected to what Mulgan (2014) calls "the radical's dilemma" which is the trade-off between: 1) working from outside existing systems to create an alternative to the status quo, but risk being ignored, or 2) working from within the system and risk only creating incremental change. Connected to the radical's dilemma is the notion that those designing from inside healthcare are particularly susceptible to what McKnight (2012) calls "the institutional assumption". This means that when thinking about an outcome that we are interested in, like health, we immediately jump to how we need to change the institution that is supposed to fulfill that outcome, like a hospital. McKnight suggests that the institutional assumption is the most consistent failure of our time in thinking about change.

This paper draws on examples of healthcare design initiatives from around the Nordic region to show the challenges of contributing to health beyond healthcare, especially when designing from inside healthcare institutions. For example, in Experio Lab's "Firstline" design project, focusing on young people's mental health, a great deal of work was done to understand the needs and experiences of children and youth in relation to mental health. Through the initial discovery phase and youth involvement in concept development within this project, three possible service concepts were proposed. Of the three concepts, two were focused on prevention and self-management in the community, and one was focused on improving intake into formal mental health services. While all of these concepts showed considerable promise, the concept that most closely connected with existing healthcare services was chosen to be developed further due to existing project partnerships and access to resources.

This pattern of uncovering insights relevant to prevention, but developing solutions that focus primarily on improving or enhancing more reactionary healthcare services can be seen across embedded healthcare design initiatives. These embedded design initiatives are a valuable and necessary element of building more responsive and adaptive healthcare systems, but more must be done to appropriately position design initiatives to address the social determinants of health and leverage design's transformative capacity in relation to disease prevention. We argue that what is needed are design initiatives distributed across the spectrum of formal and informal health systems as well as focusing intentionally on both shorter and longer-term investments in health outcomes. While major investments are being made in design initiatives within formal medical institutions, there is a great need for design initiatives that more explicitly address the informal, social aspects of health in community.

This paper paints a vision for connecting health design and social innovation approaches to more strategically influence long-term health outcomes, especially through the social determinants of health. Designing for social innovation typically involves starting with the community and building a platform and processes in which community members

can themselves work at making changes in their own lives and neighborhoods (Manzini 2015; Manzini and Meroni, 2015). This approach is fundamentally aligned with goals related to realizing long-term improvements in health outcomes and the emerging priority of designing for community health (Tsekleves and Cooper 2017). This research highlights some projects that have started to combine social innovation and design to address the social determinants of health, including: Guts to Change in Norway (Aguirre et al., 2016), Malmö Living Lab in Sweden (Hillgren et al. 2011), and the Designing for Wellbeing project in Finland (Keinonen et al. 2013). In doing so, we outline differences across national and cultural contexts in filling this gap. In conclusion, the authors call for greater investment in health-related design initiatives that are centered in community rather than medical institutions, but connected to the resources needed to realize long-term changes in health outcomes.

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# Designing emotionally resonant aesthetic experiences in healthcare.

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## Key words

product design, emotional experience, human-centred design, healthcare

## Introduction

The healthcare system is multi-layered and complex. This makes improving the quality of healthcare products in medical environments difficult. Attempting to design products to improve experiences for those in hospital environments has drawn attention to this dissonance, and how it can impact on the emotional experiences of both patients and staff in hospital environments. Products in healthcare have an often unconsidered role beyond the practical function of facilitating successful treatment outcomes. They contribute to a patient's emotional experiences that encompass a product's aesthetics, performance, usability/accessibility (Bate and Robert 2007). Despite the best intentions, the effective delivery of more holistic care can be compromised by tensions between clinical outcomes and funding. This may inadvertently result in increased levels of detachment between carers and the people they aim to serve (Jones 2013).

Healthcare as a discipline adopts 'care' as its moral obligation to provide quality healthcare by the profession's best knowledge (Wehmeier and Hornby 2000, Høiseth and Keitsch 2015).  A consequence of this is that organisation wide decision-making processes emphasise curative outcomes, often leaving other facets of the healthcare experience unconsidered (Hofmann, Perry, and Davidson 2010).

Focusing attention on the clinical aspects of treatment processes (such as chemotherapy), may be at the expense of patients' more complete emotional journeys through health system (Leininger 1977). Generally speaking, design in healthcare settings evokes images of products, services and facilities that are geared toward clinical treatment outcomes but are often aesthetically 'hard' or 'uncaring' (Ulrich 1991). Furthermore, designs that are unsuited to the broader needs of patients, visitors and clinicians may fail to deliver the intended outcomes and sometimes even contribute to negative or traumatic experiences (Mullaney et al. 2012, Ulrich 1991). The impact of the how a product is perceived aesthetically and functionally may be vastly underestimated in terms of contributing to a patient's confidence in the care they are receiving.

Emotions associated with hospital treatment often include 'hope, despair, encouragement, confusion, fear, satisfaction, anger, disappointment, loneliness, anxiety, support, depression, relief' (Pietra 2013). These emotional responses are a result of the day-to-day happenings within hospitals for patients and families (Marcos 2012). The notion of 'helpful hospital aesthetics' encourages a positive outlook on hospital experiences by creating environments that induce a sense of wellness. Improving patient experiences within this context may be achieved by creating cohesion between products in healthcare spaces to demonstrate 'care' in a more consistent, holistic fashion (Remedios 2014). Understanding product semantics can help designers purposefully use shape, texture, materials and colour to convey specific meanings to create positive experiences.

**This paper explores the broader meaning of care in 'healthcare', and considers the impact of organizational opportunities and constraints when designing emotionally sensitive products within healthcare. Two practice-led product design case studies are used to explore how we might design products for health from an emotional perspective.**

## 'The little ones' Baby Bath

The birth of a premature baby results in a period of trauma and stress on the infant's



Figure 1. Final outcome of 'The little ones' Baby bath project.

significant emotional distress to caregivers, especially those who are first-time parents. This case study discusses how the bathing process was identified as the first 'normal' activity parents and their baby experience and will forever share together in a neonatal intensive care unit (NICU). The project aim was to design a positive, nurturing bathing experience that also addressed functional problems identified by the NICU staff. A successful working prototype encompassed functional elements lacking in current ad-hoc bathing solutions and sought to establish an elegant and calming aesthetic (Figure

1). As well as being a plausible commercial solution, the design acted as a provocation that stood in stark contrast to its surrounding, clinical context.



Figure 2. Image of oncology day-stay environment.

## 'Feel' Chair—Chemotherapy Day-Stay Chair

Chemotherapy is a regimen of drugs tailored to treat each patient's whole body to help fight the growth and spread of the cancerous malignant tumours and is commonly delivered intravenously. Individual treatment sessions can last anywhere from 15 minutes to over 8 hours (Wang et al. 2011). There are various side effects, thereby the emotional experience of chemotherapy patients differs with each patient depending on their situation. The immersive design research journey revealed that the oncology environment can be perceived as hard, sterile, and uncaring—including products such as the chemotherapy infusion chair. This project aimed to better understand the **Figure 3.** Research-based, patient interaction prototyping.

**experiences of cancer patients by prototyping a reimagined chair with feedback from patients and staff throughout the process (Figure 3).**

## Conclusion

The two projects described here are symbolic of healthcare providers prioritising better healthcare experiences through design. The success of these design projects resulted



**Figure 3. Research-based, patient interaction prototyping.**

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willingness to look beyond functional considerations, to consider how a product can be designed to embody 'tenderness' or make a patient or a family member feel less 'anxious' in their healthcare journey (Berkun 2004). The use of prototypes to communicate ideas and concepts was critical to bring the team together to create a shared common vision to explore how products are designed in an 'emotionally sensitive' fashion. The resulting artefacts themselves have agency that helps communicate the 'voice' of the end users, as well as suggests a way forward to reconsider the aesthetic of products designed for hospital care.

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# Evaluation of universal design—A scoping project

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## Keywords

Universal Design, Evaluation, Built Environment

## Introduction

"Universal Design is the design of products and environments that are usable by all people, to the greatest extent possible, without the need for adaptation or specialized design (Mace 1985 as cited in Steinfeld and Maisel 2012, 28). Although universally designed environments have direct benefits for people who experience disability, Universal Design does not focus solely on people with disabilities but rather on all people, as we all have differing abilities and size and no-one is immune from aging, frailty or disability (Centre for Universal Design 2008). Current definitions of Universal Design emphasise it as a design process and that its outcomes are linked to health, human performance and social participation (Steinfeld and Maisel 2012).

In Australia, local and state governments are increasingly developing policies that demand application of Universal Design to built environments but, at this stage, do not outline how Universal Design is to be applied or, importantly, evaluated. There is currently no widely accepted or consistent method of evaluating the application of Universal Design to the design of built environments in Australia or internationally.

This project aimed to scope existing methods of evaluation used to evaluate the design process and/or the outcomes of applying Universal Design to built environments. It aimed to identify perceived strengths and weaknesses of existing methods of evaluation and potential strategies to improve practice in this area.

## Method

This project was staged in three phases and used a mixed-methods approach to data collection and analysis. Ethics approval was gained from Deakin University HEAG-H.

## Phase 1: Literature Review and Website Audit

A review of existing literature and an audit of publicly available web-based information served to identify existing tools and methods to evaluate Universal Design and potential key informants for Phase 2 and 3 of the study.

## Phase 2: Electronic Survey

A bespoke electronic survey was developed and used to gather descriptive data on people's experiences and perceptions relating to the application and evaluation of Universal Design in built environments. The survey was promoted to professional practitioners, peak industry bodies, policy makers, expert users and academics. A descriptive approach was employed to analyse the data collected via electronic survey.

## Phase 3: Key Informant Interviews

In depth interviews were conducted with key informants. Key informants were identified via known professional networks or had indicated their interest in participating in an interview when previously completing the project survey. Interviews were audio-recorded, transcribed and a grounded theory approach has been employed to analyse findings.

## Findings

At the time of writing, data collection via survey has been completed. A total of 157 survey responses were received from across Australia (83%) and internationally (17%). Data analysis is now underway. A large proportion of respondents (41%) were aged 55 years and older, and the gender distribution was relatively stable (53% male). The most commonly encountered professional groups were project managers (30%), academics (24%) and access consultants (14%), and over half of survey respondents (59%) had lived experience of disability or illness. Current knowledge of the Principles of Universal Design (Connell et al., 1997) (Mean = 6.03), Goals of Universal Design (Steinfeld & Maisel, 2012) (Mean = 5.55) and application of Universal Design (Mean = 6.36) tended towards the middle of a ten-point scale.  Just over one third had experience evaluating the application of Universal Design to the built environment (36.3%), and the majority of these respondents (73.7%) had used specific tools for this purpose. In depth interviews are currently underway and in total approximately 36 interviews will be conducted.  Qualitative data analysis has commenced.

## Discussion

Findings from this project offer further insights into how Universal Design is understood by a range of key stakeholders and, importantly, how it is applied to the design of built environments both in Australia and internationally. Preliminary data analysis indicates that evaluation of Universal Design is important but complex and challenging.

Limitations of this study include that the sample, although large, is predominantly Australian. Additionally, the project has primarily focused on the application and evaluation of Universal Design in public premises rather than domestic dwellings. Finally, the focus of this study was on the evaluation of Universal Design in the built environment but only a small number of survey respondents had actual experience of evaluating the application of Universal Design to built environments.

# Conclusion

Little is known about how the application of Universal Design to built environments is currently being evaluated or what method(s) of evaluation are perceived to be appropriate and of value to key stakeholders. Findings from this study suggest that, despite an increase in rhetoric emphasising that Universal Design should be, and is being, applied to the design of built environments there are limited examples of the Universal Design process or related outcomes actually being evaluated. This research suggests that there is a need for greater information and knowledge for use by industry professionals and policy makers in this area. Findings also suggest there is a potential need for new methods of evaluation to be investigated.

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# Decreasing the burden of hypertension: A design intervention to foster more accurate blood pressure measurements.

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## Keywords

Cardiovascular Disease; Psychological; Physiological; Health; Environment.

## Introduction

Cardiovascular disease (CVD) is the leading cause of death and disability globally and carries the greatest economic burden of any disease in Australia (Collaborators 2013, Welfare 2014). High blood pressure is an independent risk factor for CVD and considered one of the most important measurements in clinical medicine (Pickering et al. 2005, Lim et al. 2012). The medical environment has been shown to influence blood pressure (BP) measurements, resulting in inaccurate hypertensive readings for between 15 – 30% of patients (Tsai 2002, Imms et al. 2010) The 'white coat effect' theory relates hypertensive BP measurements with anxiety caused by the presence of a doctor (Cuspidi et al. 2016, Franklin et al. 2013, Mancia et al. 1983). However, recent research suggests the medical environment itself may have a greater effect on BP measurements than patient-practitioner interaction (Adiyaman et al. 2015). This is supported by a range of studies that investigated how isolated spatial and material properties affect BP measurements (Cracknell et al. 2016, Dijkstra et al. 2008, Kuller et al. 2006, Stamps 2005, 2010, Ulrich 1984, Zhang et al. 2017).

The aim of this project was to develop a booth to provide a controlled micro-environment that could be installed in medical settings to enhance the accuracy of BP measurements. The design research investigation was part of a larger study—IDEAL (Improved cardiovascular Disease hEALth service delivery in Australia), that aims to develop a new method to collect and deliver information on absolute CVD risk, including BP measurements, to general practitioners (GPs). Patients referred to pathology services for a cholesterol blood test will be invited to have an absolute CVD risk assessment within the booth. This risk assessment will include collecting information on risk factors related to CVD and BP measurements, via a purpose-built app; using this information an absolute CVD risk score will be calculated and sent to the referring GP.

## Literature and design approach

A review of existing literature identified three crucial factors that influence stress, anxiety and BP measurements and which guided the design of the booth:

(1) An innate connection to nature (the biophilia hypothesis),

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(2)  Innate survival instincts (the prospect and refuge theory),

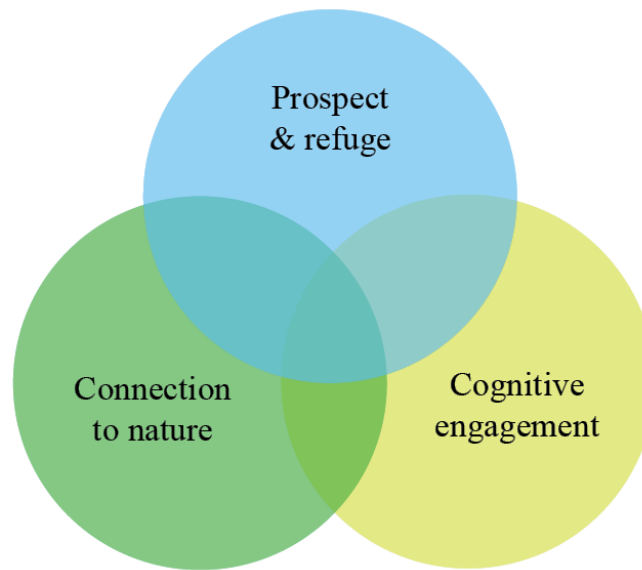(3)  Cognitive engagement (visual and/or audio)



**Figure 1. The three crucial environmental factors that influence stress, anxiety and blood pressure**

The biophilia hypothesis explains how our primitive survival instincts influence the way we subconsciously react to our immediate environment, which directly influences stress, anxiety and BP. We typically respond well to nature (i.e. plants) and colours or materials that represent nature. The same primitive instincts influence the way we perceive space and various levels of enclosure (Kaplan 1995, Wilson and Kellert 1993). A connection to nature has been realised in the design of the booth in this study using plants and greenery, natural materials (i.e. timber), and by following an overarching theme of soft and natural forms.

The prospect and refuge theory proposes that our contemporary reactions to space are due to innate survival instincts developed over thousands of years of evolution. In a hunter-gatherer sense, the term prospect refers to an unimpeded opportunity to see, while refuge refers to an unimpeded opportunity to hide (Appleton 1986, Vartanian et al. 2015). The theory motivated extensive exploration of patient comfort, not in terms of ergonomics, but in how the spatial configuration of the booth supports innate survival instincts. For this reason, the patient is orientated with their back to a solid wall and the doorway to their side. Additionally, a perforated screen next to the doorway affords the patient an opportunity to see out of the booth, without feeling exposed to other patients and staff members within the facility. These aspects support a neutral environment for accurate BP measurements that could also be suitable for other clinical measurements with minimal adjustment.

Visual and audio distraction can help decrease pain, stress and anxiety in patients in a medical environment (Diette et al. 2003, Nanda et al. 2011, Nanda et al. 2012, Navit et al. 2015, Ulrich 1984, Wang, Chen, and Sun 2008). Low-level visual and audio stimuli have been implemented into the design of the booth to reduce stress and anxiety, normalising BP measurements.
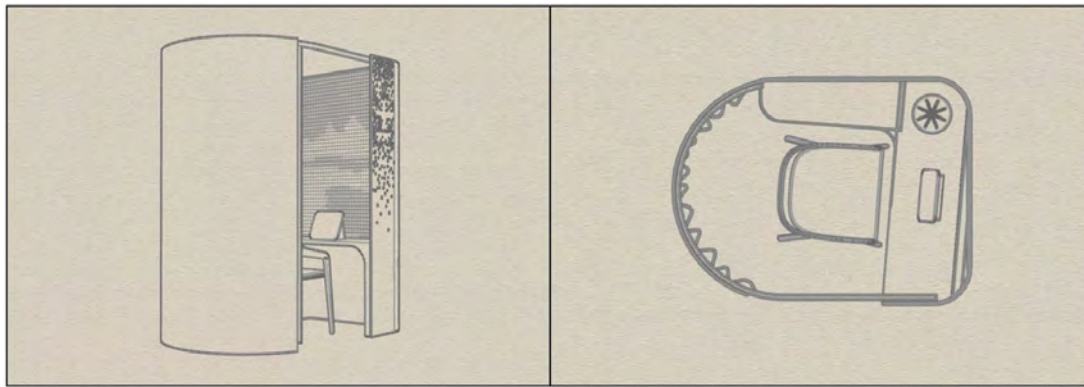
**Figure 2. Left: Perspective sketch of booth design, right: sketch demonstrating patient orientation**

# Design Research Methods and Testing

The design development process employed digital and physical mock-ups and prototypes. Conceptual design propositions were initially modelled in Rhinoceros®, accommodating multiple design iterations and rapid design development. Virtual reality (VR) was also used as a key design development tool to assess the scale of the booth and the calming effects of proposed materials and spatial configuration. VR rapidly increased the speed of the design development process and decreased the extent of manual prototyping required. The VR model together with a 1:1 schematic prototype were used to pilot test the design of the micro-environment in September 2017 by members of the IDEAL study team and relevant stakeholders.
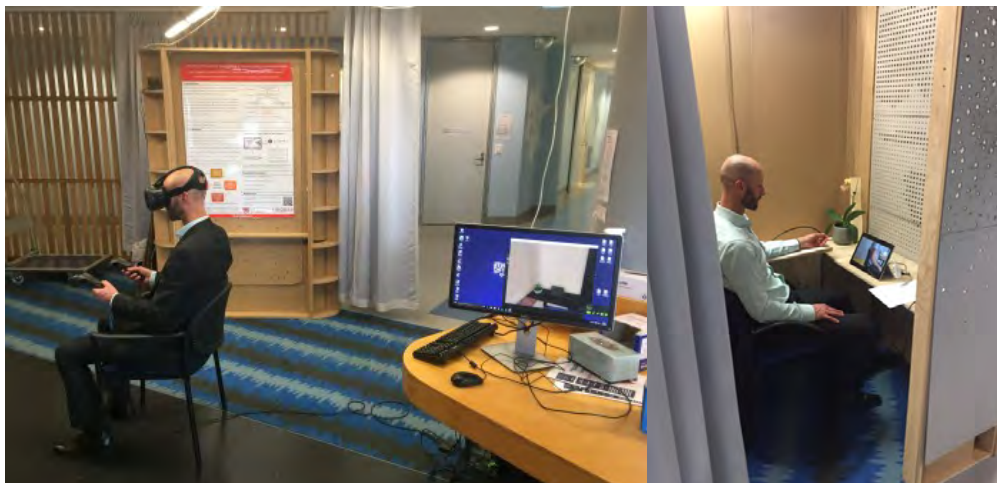


Figure 3. Pilot test of booth design with VR (left) and 1:1 schematic prototype (right).

The next iteration will be tested by approximately 300 participants at a pathology clinic in Hobart, Australia in early 2018. This real-world testing will be compared to BP measurements in a controlled lab study to give valuable qualitative and quantitative feedback to inform future design developments of the micro environment.

# Conclusion

Many studies have assessed how various materials and environmental elements individually effect stress, anxiety and BP measurements. This project is unique as several

environmental properties known to influence BP measurements are actively synthesised into the design of a micro environment which can be adapted for a variety of healthcare settings and procedures. Additionally, real-world testing will provide tangible evidence regarding the booth's capacity to attain accurate BP measurements. A micro-environment that enhances the accuracy of BP measurements and assists with absolute CVD risk assessment will benefit GPs, in decisions regarding CVD risk management which is expected to result in better patient outcomes.

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# Developing the Double Diamond process for implementation—insights from a decade of Inclusive Design projects

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## Keywords

Inclusive Design, Design Management, Implementation

## Introduction

This paper details overarching methodological insights resulting from several Inclusive Design projects in healthcare spanning ten years. The insights draw on projects undertaken in partnership with a range of partners (commercial, public sector and charitable), differing in scope, funding and degree of implementation. A number of lessons have emerged, both practical and methodological, and are applicable to future design work in healthcare and the implementation of innovation.

## Background

The projects informing these insights are the result of funding partnerships and collaborations. This is an important context, as the work is research driven; it does not follow a consultancy model, nor is the design work beholden to the client's agenda.

The Double Diamond methodology (Design Council, 2015) was used in all projects. This well-established approach follows four phases: Discover (divergent thinking, researching problem), Define (convergent thinking, refine problem), Develop (divergent thinking, generating concepts) and Deliver (convergent thinking, refining concepts down to one or more). There are many variations of this model, and this methodology is increasingly run in parallel / mixed with an agile approach and PDSA cycles (Speroff and O'Connor, 2004), where rapid iterations of the methodology are run in series.

Another important contextual note is that projects tended to run for a year or more, allowing more time for a thorough user research period. An important remit of the work is to reflect upon practice, and the insights detailed here are not only retrospective but collected as the projects were in progress.

## Methodological benefits

The Double Diamond is a known framework, and lends itself well to interdisciplinary working (West et al, 2014) as it is relatively easy to articulate the shared goals of each phase, particularly to front line clinical partners, in order to achieve a common understanding. Within this established framework, it is then easier to tailor co-research and co-design methods to suit specific user groups. The divergent and convergent

phases also offer opportunities for designers to immerse themselves in a given context, but also to withdraw and reflect.

These methodological benefits can be added to by further work at the start ('Discover') and more extensively at the end ('Deliver') phases.

## Initial setup

The Double Diamond typically starts with a 'problem statement', with the 'Discover' phase involving co-research by the design team with relevant stakeholders and users to explore the problem from numerous different viewpoints. In order for this to be fully effective, much of the administration must be done in advance. The setting up of user groups, identification of gatekeepers, and importantly, obtaining any necessary ethics for the project can take time. With an engaged clinical partner, such steps can be taken in advance of (or early on in) the 'Discover' phase to reduce any delays in research (ICU journey).

## Implementation

The final phase of the Double Diamond concerns delivery. The exact form that 'delivery' takes is unique to each project and partnership, but merits careful examination. Implementation of innovation is notoriously difficult in healthcare (Morris et al, 2011). Typically this is seen as post-'design', and necessarily requires the commitment of any healthcare project partner. Whilst some of the best innovations win design awards, many award-winning designs are not adopted into front line use. There may be more to be done in design terms. The practices of co-research, co-creation and co-design are well used. Could co-implementation be an additional focus? This opens the door to the debate about where 'design' ends, though clearly the end point at present is not leading to large scale implementation. Co-implementation efforts should start well before the end of the 'Discover' phase. These efforts may involve the identification of implementation stakeholders (standard practice in much co-design), but also funding bodies (Foyle Bubbles, Foyle Reeds), the development of business cases and the adoption of commercial constraints in the design (SlowMo/Mo).

Longer term implementation efforts may not be the focus of design, which then points to the need for a proper definition of an 'end' point. For startups, this might be the exit strategy, but for design projects it is context dependent. A service design improvement might see initial demonstrations in context (Patient Flow) as an end point; a product design might seek clinical trials, or a licensing agreement. As the technology for designing and prototyping improves, the fidelity of the output of such projects also increases. In a competitive innovation market, this means the level of necessary evidence behind an innovation in order to attract buy-in and adoption increases. This level should be scoped out during the 'Develop' and 'Deliver' phases. Accepted good practice in forming a brief (typically at the centre of the Double Diamond) is to embed measurables into the brief statement (Zenios et al, 2010). In the same manner, an end point for design efforts should be defined during the 'Deliver' phase or earlier, to ensure an agreed plan for implementation. Without this, there is the risk that the design project

results in a prototype being handed over to an implementation partner with no understanding of the means of adoption.

# Conclusion

The Double Diamond is an accepted design research methodology, increasingly adapted and tailored to include other methodologies. It is a useful framework for interdisciplinary collaboration in that it can form a ready basis for a shared understanding of aims and work plans. The benefits of this approach are increased by advance preparation, and by thoroughly scoping implementation factors and stakeholders towards the end of the project.

Adoption of innovation in healthcare takes time, and is fraught with many complicating factors. Many lauded design outputs are not in use, pointing to poor implementation strategies. The above benefits of the Double Diamond must be applied to implementation in order to help adoption. Much more can be done during the design process to make the outputs better positioned for implementation. This not only means involving the relevant stakeholders and identifying the relevant funds for implementation earlier in the process, but crucially designing the output with an implementation strategy in mind. This practice of 'co-implementation' will improve future adoption of innovations.

# Acknowledgements

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# SlowMo/Mo—digital technology to provide support in coping with daily life

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## Keywords

Digital health, mhealth, etherapy, inclusive design

## Introduction

This project builds on previous work bringing inclusive design methodologies and expertise to therapy for paranoid and suspicious thoughts in people with severe mental health problems. Culminating in an interactive digital platform to support service users both in and outside of therapy sessions, this prior work established core design principles (West et al 2016), with the platform currently going through a multi-centre randomised controlled trial (Garety & Hardy, 2017).

This project seeks to extend the benefits of the digital platform beyond diagnosed mental health difficulties to include a standalone app for anyone seeking to better regulate emotions and cope with daily life. Difficult emotions and life stressors are ubiquitous, but access to psychological interventions is limited (Haller et al, 2014). Even when available, people can be reluctant to take them up (O'Dea et al, 2015).

The establishment of design principles when considering 'extreme' users (service users with severe mental health problems) lays the foundation for interventions that benefit a much broader cohort. It is in the appropriate application (and augmentation) of these principles that the success of this project hinges, with broader implications for digital innovations for mental health.

## Background

SlowMo is a digital platform resulting from a partnership between psychologists and designers, working closely throughout each project phase with front line therapists and mental health service users presenting with differing degrees of psychosis. Previous therapy had comprised six sessions, supported with basic visual materials, helping service users notice unhelpful thoughts and fast thinking habits, and improve slower thinking. The SlowMo intervention redesigned the content, adding an app extending the benefits of therapy beyond the consulting room to people's daily lives. The intervention is being tested in a randomised controlled trial. In parallel, the team is building on this work to create an intervention for a wider user base: those who seek better emotional regulation and support in coping with daily life. Translating the SlowMo design and therapeutic principles into a commercial product broadens the reach and potential benefits, but requires a different design approach.

## Methods

The fundamental therapeutic principles underpinning SlowMo include (among others) the ability to recognise unhelpful thoughts, to slow down 'fast' thinking (jumping to conclusions), and the identification of alternative explanations for the observed situation or upsetting thought. The design principles of SlowMo include (among others) representing thoughts as bubbles, resizing them, and slowing down 'spinning' bubbles to encourage the user to engage in slower thinking. A larger scale clinical trial will establish its clinical efficacy compared to treatment as usual. The project aim is to adapt and expand both the therapeutic and design principles to target a broader audience with common emotion difficulties experienced by the majority of the population.

The team combined the 'Double Diamond' methodology (Design Council, 2015) with agile working with developers (Dybå, Dingsøyr et al. 2008). Insights were gained through extensive interviews and workshops with a variety of potential users. Personas were built up from these insights, informing subsequent co-creation sessions. A number of extra functions and concepts were created, and refined using critical feedback. The additional app framework and functionality were refined, along with the visual language and branding. Rapid iterative design and coding work packages allowed for the collaborative development and testing of sections of the app.

## Design

The aim was to expand the focus beyond fast thinking to a broader range of thinking habits targeted in CBT, and incorporate other psychotherapeutic strategies (i.e. relaxation, distraction, mindfulness). This integrated a range of different therapeutic approaches to create an emotional regulation toolkit and bring the benefits of varied strategies to as many people as possible.

Much of the original SlowMo design work is retained. Bubbles are still used to recognise and visualise difficulties, and the focus on slowing down thinking and logging alternative and less upsetting thoughts is included as a type of emotion regulation, sitting within a broader framework of features and functions. Bubbles now reflect any type of difficulty and coping strategy (e.g. behaviours, relationships, emotions, as well as thoughts).

The research, mirroring empirical findings, suggested that supported therapy is more helpful than pure self-help. This led to the development of 'Mo', a personalised digital therapist. Mo supports the user with their difficulties, helps them find strategies to cope and encourages them to focus on solutions. The research pointed to the importance of the digitised therapist's interpersonal style for users' engagement. Responding to the insights, Mo can adopt one of three different personality types (selected by the user, delivering the same content in differing styles): friend, therapist and coach.

The app is structured such that Mo provides an introduction and overview to the user, as well as checking in with them periodically. Mo guides them through much of the SlowMo content, to help support more helpful thinking habits. These are now conceptualised as 'life traps' to reflect the broader range of issues people may input into the new interface, and represented visually as well as by text. Mo can also direct the

user to a 'GoMo' section of the app (games to support distraction) and a 'FlowMo' section (tasks to support relaxation and mindfulness).

These functions augment the original 'SlowMo' to broaden the appeal to a range of users. The addition of Mo, and the ability to tailor the personality of the digital therapist is an important feature, as there is no longer a human therapist present.

## Conclusion

The methods employed in both the original SlowMo and the augmented version (with Mo) were largely similar. The aims and insights were different, leading to distinct design solutions, albeit with overlapping features and functions. The additional features in Mo allow for targeting a broader market and range of needs. This reflects a focus on improving access to psychological techniques in the general population, to address limited availability of therapy and barriers to people seeking help. It is envisaged that this broader focus will lend itself to user testing with diverse groups, with insights iteratively incorporated into future versions of Mo, laying the foundations for a strong commercial product launch.

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# Co-creating a digital decision aid for people with dementia and their caregivers to fulfil their unmet needs

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## Keywords

Dementia, co-creation, design, social innovation, decision aid.

## Introduction

The social and economic policies of many Western countries stress the need for self-care and autonomy in the management of dementia and provide support to people with dementia to live in their home as long as possible (e.g., Dunnell, 2000; Thomson, Foubister & Mossialos, 2009). An increasing number of products and services are available as support in everyday activities and challenges of living with dementia, however research and practice show that people with dementia and their caregivers have difficulty in accessing these (Meiland et al., 2017). Reasons are that they are not aware of the existence of the relevant solutions (Donath et al., 2011), information provided about the support is unclear (van der Roest et al., 2009), and the solutions are insufficiently attuned to individual needs and contexts (Lauriks et al., 2007, van der Roest et al., 2009). A means is lacking, which can help people with dementia and their caregivers to find the available relevant support and offer flexible and personalized solutions.

In project FIT, we develop a digital decision aid for people with dementia and their caregivers to identify their specific personal and contextual needs and get customized advice about available assistive technologies and care services that can alleviate unmet needs. FIT is a collaboration between two design research institutes, three research institutes in healthcare, three care organizations and some Small Medium Enterprises (SMEs) in the Netherlands. The project followed an iterative and collaborative approach in which different expertise met and reinforced one another.

In this paper, we will very briefly describe the development of the FIT decision aid, which involved multiple co-creation steps between designers, people with dementia and informal caregivers, care professionals, field experts and policy makers. We will conclude the paper with the insights we gained on conducting participatory design in the field of dementia and having effective crossovers between the fields of healthcare and design.

# Method

We first conducted interviews, a diary study, and two focus groups with people with dementia and caregivers in order to investigate their needs while collaborating with two psychiatrists to coordinate the findings with relevant knowledge in the dementia care literature. We then created a comprehensive inventory of the product and service solutions in the Dutch market by the involvement of all project partners and target users (Bosch et al., 2017).

To match these solutions with the specific needs they can help with, two designers, a psychologist with an expertise on shared decision-making and a sociologist with an expertise on aging societies created a conceptual structure (Cila et al., 2017). The structure starts from one of the "need" levels found out during the interviews (e.g., health), proceeds by asking questions to specify the "goal" related to that need (e.g., being able to speak and communicate), and ends by finding the "product category" that can answer that goal (e.g., picture books for dementia), see Figure 1. The list of goals was compiled through multiple co-creation sessions between designers and nurses, in which the activities and goals relevant for the dementia context were investigated.
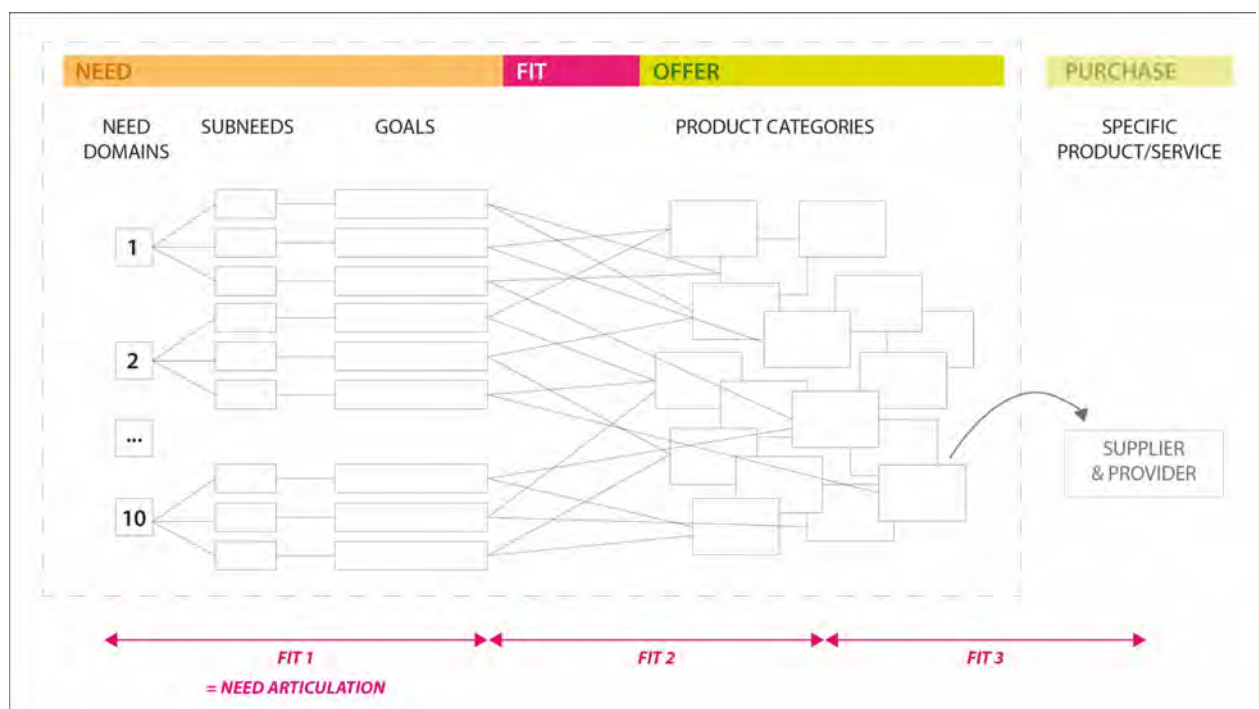


Figure 1. Conceptual Framework of the FIT decision aid.

The products and services were matched with specific goals they can help with through two sessions: The first session was between two designers and a web shop owner that sells products for dementia care and the other with designers and a researcher who created a platform for finding dementia care and welfare services in the Amsterdam region. After setting up the "fit" between needs/goals and product/service solutions, the designers created three medium fidelity concepts and tested them with care professionals, informal caregivers and people with dementia.

User experiences with the decision aid were collected by means of structured questionnaires and focus groups among informal and professional caregivers. The findings were merged into a final design, which can be seen in www.fit-keuzehulp.nl, see Figure 2. With the involvement of a social policy maker and a member of the Gooi region municipal office, currently the project is exploring possibilities for large-scale implementation of the decision aid. This involves tackling the issues of ownership, keeping the information about products and services up-to-date, and the tool as an objective, reliable platform for finding supporting solutions for the everyday challenges encountered in dementia.



**Figure 2. Two screenshots of the FIT decision aid.**

# Insights from a crossover between design and healthcare

Three main insights were extracted from our experiences of multiple co-creation sessions (Janssen et al., 2017):

- Changing role of designers: The designers involved in the project only "designed" in the traditional form-giving sense in the last stage of the project where the decision aid tool was given shape. In the majority of the process, their role was to co-create with "non-designers" and facilitate them with tools, methods and approaches that supported their creative thinking (Wildevuur et al., 2013; Sanders & Stappers, 2012). This way of working helped to leverage the expertise of different partners in the best way possible, as well as provided more

motivation and ownership among the partners about the development of the decision aid.

- The methods of design research: At first, the care professionals and clinical researchers accepted some of the methods of design research with suspicion. However, at the end they acknowledged the complete picture and rich insights they gained about the target group when design probes were combined with interviews and questionnaires. We benefited from bringing many examples, explaining the expected outcomes, and discussing the scientific contribution of the design research methods to project partners under multiple occasions.

- Finding a common language: The worlds of design and healthcare differ in terms of their approaches to problems. It is a challenge to find a common language that both parties can build upon the strengths of each other; this situation can hinder the involvement of people and trust between project partners. We benefited from organizing activities specifically meant for building a common language and a trust relationship, such as a reading club, a hackathon, and a persona creation session.

# Conclusion

Many challenges in health care are ill-defined problems of which the desired outcome is unknown beforehand and which require involvement of different perspectives to be solved. Co-creation is a valuable approach in tackling such projects. Involving a wide variety of expertise in different stages of the design process allows for a thorough understanding of unmet needs, and the design of tailored solution that meet those needs.

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# Designing Information and Communication Technologies to support chronic disease self-management in practice: a case study from Australia and the Netherlands

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## Keywords

design, partnership, Information Communication Technologies, chronic disease, self-management

## Introduction

The professional partnership that lies at the heart of person-centered care (PCC) is often neglected in the design of Information and Communication Technologies (ICT) aiming to facilitate chronic disease self-management (Heckemann, Wolf, Ali, Sonntag, & Ekman, 2016; Wildevuur & Simonse, 2015). PCC involves the patient actively in the care process as an equal partner and expert on living with a chronic condition (Bodenheimer, Lorig, Holman, & Grumbach, 2002). Research has shown that a person-centered approach to care increases the self-efficacy of patients, improves quality of life and shortens hospital stays (Dudas et al., 2013; Ekman et al., 2011).

Information and Communication Technologies (ICT) are considered an important enabler of person-centered care, particularly the partnership between the patient and healthcare professional(s). ICT offers ways to connect chronic patients and their healthcare providers around the clock, contributing for example to shorter hospital stays and enhanced self-monitoring (Wolf et al., 2012; Swedberg et al., 2011). Results of studies on ICT enabling Person Centered Care (in short: ICT-enabled PCC) are promising, with improved clinical outcomes, increased health-related quality of life and cost-effectiveness (Heckemann, Wolf, Ali, Sonntag, & Ekman, 2016; Wildevuur & Simonse, 2015).

However, hardly any of the ICT applications aiming to facilitate chronic disease self-management support the partnership between patients and healthcare professionals (Heckemann et al., 2016, Wildevuur et al., 2015). The four user-related preconditions of ICT-enabled PCC are: (shared) decision making, personalized ICT, health-related quality of life, and efficiency (Wildevuur et al., 2017). These four preconditions together can improve people's self-management of chronic diseases by strengthening the partnership between the patient and the healthcare professional. A discrepancy can be found between intended and reported actual outcomes in terms of realizing person-

centered care (Wildevuur et al., 2017). ICT applications for healthcare purposes are often developed for – rather than with – the intended users, for which reason they are insufficiently tailored to the individual needs of people with chronic conditions (Merolli et al., 2013). Therefore, this study seeks to improve the design of ICT-enabled PCC by answering the research question: How does ICT support the partnership in practice between patients and healthcare professionals towards chronic disease self-management?

## Methods and results

We conducted a study that used a qualitative research method relying on "focused" interviews. As we did not come across case studies in the literature that illustrated or helped us understand how to design ICT to support the partnership in practice between patients and healthcare professionals in chronic disease self-management, we used examples of ICT-enabled PCC provided by the interviewees.

The participants (patients, healthcare professionals, policymakers, ICT developers, designers and healthcare insurance specialists) were selected based on their experience with ICT in supporting chronic disease self-management. The interviews allowed us to carry out an in-depth analysis of the experiences of key figures with (the design of) ICT to support chronic disease management in healthcare practice (Merton & Kendall, 1946; Yin, 2013). The interviewees were asked in an open, semi-structured way about their experiences with ICT-enabled PCC.

In order to improve our understanding of how the design of ICT facilitates the partnership between patients and healthcare professionals in chronic disease management, we choose two contexts. One setting is the Australian healthcare one, given the fact of a very large, relatively sparsely populated country. In Australia patients and health care professionals are geographically separated; at times ICT may be the only way to facilitate the partnership. The other setting selected was the context of the Netherlands. The Netherlands is a small, densely populated country; distances are hardly a reason to use ICT to support the partnership between patients and healthcare professionals. Furthermore, regarding ICT infrastructure, the Netherlands is the header within Europe. This makes it potentially a perfect country to implement technology based health care services, such as ICT-enabled PCC. So, one would expect that ICT would be used and practiced a lot both in Australia and in The Netherlands to facilitate the partnership between patients and healthcare professionals.

Seventeen participants (n=17) were interviewed: ten from Australia and seven from the Netherlands. Purposive and snowball sampling (interviewees identify further participants) were used to locate local key figures. The sample included a wide spectrum of participants who had been involved in supporting chronic disease self-management with ICT.

The interviewees named a wide variety of experiences with ICT-enabled PCC, such as: telemedicine (telemonitoring and telediagnostics), self-measurement (apps to track asthma or diabetes) and blended care (combining face-to-face and ICT support). Others referred to functionalities that facilitated the partnership between patients and

healthcare professionals, such as online appointment booking and online medication records. More concrete cases included (personally controlled) electronic health records, ophthalmologic telediagnostics for diabetes patients, and a chronic pain management telehealth system.

The cases of ICT-enabled PCC mentioned by the participants were analysed by following the initial steps for structuring of qualitative data using the Gioia methodology (Gioia et al., 2013). This methodology is a systematic approach to new concept development and theory development, useful for grouping and analysing the data from the interviews. This led to three different themes, namely: I) facilitation of the partnership, II) actual use of ICT-enabled PCC, and III) design of ICT-enabled PCC.

# Conclusion

Information and Communication Technologies hardly support the partnership in practice between patients and healthcare professionals towards chronic disease self-management. Even though the partnership is considered important – if not crucial – within chronic disease management, the four preconditions of ICT-enabled PCC are seldom met. There were hardly any differences between the contexts studied in Australia and the Netherlands. Both faced the same types of barriers to the actual use of ICT in supporting the professional partnership between patients and healthcare professionals. Further research is needed on the facilitators and barriers of implementing ICT-enabled PCC, and the role design can play in supporting the implementation and use of ICT-enabled Person Centered Care.

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# What we wish we had known when we began: Insights on designing together with people with dementia in research and education

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## Keywords

dementia design, person-centred care, participatory design, design process, designing for one

## Introduction

Since 2011, we, in the capacity of designer/researcher, have been designing together with people with dementia. Through the experience of working together with carers and people with dementia in their homes and care facilities, in both educational contexts as well as funded research, our way of working has been trialled in numerous iterations (4 funded research projects across 6 years in nearly 20 international courses and workshops with design students taking place in over 15 care facilities). This iterative and reflective approach has been consistently refined, applied, and further developed in both the classroom as well as research contexts. For designers, researchers, and design educators looking to design together with people with dementia, this paper will propose practical recommendations for including them in their design process.

## How this approach is theoretically grounded: a summary

Termed loosely designing together with people with dementia, the heart of this approach is an inherent belief in the value of person with dementia's personal experience and their contribution. For the designer designing 'together with', this experience focuses on personal interaction and advocates designing for one where the needs and abilities, and the context of their design partner (the person with dementia) take precedence (Wilkinson et. al. 2017).

This idea of contribution is rooted primarily in principles of Participatory Design (PD) and Experience-Centred Design (ECD) which both place value on the contribution of the person who will use/benefit from the design and look to empower marginalised people groups by giving a voice to those overlooked or disempowered by design processes (Hwang 2016; Ehn 2008 quoting Star and Ruhleder 1996). Next to this, ECD specifically places emphasis on the "richness of human experience, a concern for meaning and how people make sense of their experiences" (Hwang 2016, p. 61). By focusing on an individual's capabilities, wishes, interests…and by designing for the individual instead of a sample user group or generic conditions of dementia, the designer builds on a knowing and understanding of the person (Brown et al., 2001). This process of getting to know

and understand are core tenants of person-centred care (PCC), and designing in this way places importance on the very human interactions PCC values: being in relation, being in a social world, being in place, and being with self (McCormack 2004).

Although the focus of our approach is on the individual, it also places value on the network of care/carers surrounding the person with dementia (Hendriks et. al. 2014). Because it places importance on time spent in a care facility or home situation, an awareness of the context of care and imposed limitations within care are integrated. In this way, designers and design researchers become explicitly aware of a design's ability to fail if it doesn't fit into daily care routines or is misunderstood by carers and family members. However, because of their familiarity of the context of care, designers are also made aware of the potential role for design in care. Because this approach takes place outside the restrictions of industry in terms of budget and time allowance, the bespoke outcomes often possess little quantified economic value. The importance then, is placed not on potential monetary gains, but in potential benefits for the person with dementia and his/her care context. Finally, for designer-researchers (and carers) looking for new ways to generate meaningful ideas/interventions, this way of working has the potential to arrive at a unique design that has the potential to be valuable for others. In this way, this personal approach can initiate a transferable/generalisable design: designing for many by designing first for one.

## Conclusion: Sharing the recommendations

Instead of creating guidelines or a toolkit that would propose how to design together with people with dementia, it is our view and our experience "that no general passe-partout participatory method of working with people with dementia can be found" (Hendriks et. al. 2014). Methods are often presented "as a set of reproducible techniques, the researcher as an objective observer, and culture as a pre-existing entity where members of the cultural group are characterised by traits and averages" (Lee 2012, 7). Dementia, however is not a homogenous group. It manifests and impacts daily life differently from person to person, and these points of difference necessitate customised approaches; for researchers and designers to "adjust their strategy and techniques to suit the particular situation (i.e. the participants, the problem space, the context of use) of each project" (Blomberg in Muller et. al. 1991 in Hendriks et. al. 2015).

The knowledge garnered during the iterations of designing together with people with dementia over the past 6 years have been drawn into the following clusters: challenges one should consider when designing together with people with dementia and practical recommendations for how one can approach designing together with people with dementia. Although the challenges have already been shared in an academic context, these practical recommendations are yet to be disseminated.

To share these recommendations, this paper will draw on the idea of method stories. Method stories focus on "what designers actually do and feel when making their methods work" instead of presenting only process or design outcomes (Lee 2012, 1). Suggesting that this form of storytelling is a way to share authentic research experiences with other design researchers Lee suggests that stories allow insight into how methods "work in reality, in a specific design setting, instead of how they ought to work in theory,

in a controlled environment" (2012, 4). Our eleven recommendations will thus be described from within situational sketches (environment, key players, what was experienced, what was changed, what thoughts the designer had) in order to share how these insights came to be. In this way, readers will be better able to contextualise the origin of these insights, better understand how they can be applied to their own design practice and make room for adding (and sharing) insights of their own.

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# Violence, vulnerability, and care: A women's history of HIV in America

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## Keywords

Participatory Design. Public History. Public Health. Public Media. HIV/AIDS.

## Introduction

Women living with HIV are moving from the margins of what was once a deadly epidemic to becoming survivors, storytellers, and history makers. While medical treatments have radically decreased mortality rates for HIV and AIDS over the past two decades, the social structures that disproportionately impact vulnerable communities—and stigmatize those infected—remain static.[1] HIV has historically highlighted structural vulnerabilities and inequalities; thus, it has always been political. During the 1980s, the Reagan administration's inaction (and clear indifference) to the epidemic's toll on specific segments of the American population catalyzed a generation of activists—including many artists and designers. Today in the United States, HIV is reasserting its political significance amidst rising infection rates, an "opioid epidemic,"[2]

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[1] Center for Disease Control and Prevention, "CDC Fact Sheet: Today's HIV/AIDS Epidemic,"

https://www.cdc.gov/nchhstp/newsroom/docs/factsheets/todaysepidemic-508.pdf

[2] U.S. Department of Health & Human Services, "The U.S. Opioid Epidemic," https://www.hhs.gov/opioids/about-the-epidemic/

and a new federal administration that seems not just indifferent but actively hostile toward the health and well-being of the country's most vulnerable communities.[3] Conservative US lawmakers right now are proposing sweeping changes to the American health care system, including gutting federal support for Medicaid, that will generate life-threatening consequences for millions (Kaplan and Pear).

History Moves is a research collaborative at the intersection of history and design. Our projects strive to make the production of public history more participatory and more engaging. We synthesize public historical and participatory design methods for the collaborative collection, curation, design, production, and study of politically relevant public histories. We partner with topically-connected communities, who have limited representation in and access to the construction of public narratives, to investigate various contemporary "publics."

Since 2014, the History Moves team has collaborated with 45 women living with HIV in three distinct locations across the United States: Brooklyn, Chicago, and North Carolina. Together, we have produced traveling exhibitions and other public media that expose these women's overlapping structural and environmental vulnerabilities along with the complex social realities of living with HIV. What initially brought these women together is the Women's Interagency HIV Study (WIHS), the longest running longitudinal study of women with and at risk for HIV in the United States. Our methods transform anonymous subjects of a medical study into a network of agents actively shaping their own historical narratives—moving from anonymity to authorship.

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[3] See the BLANK page on the White House's web site for the Office of National AIDS Policy: "Office of National AIDS Policy," the White House, accessed June 27, 2017, https://www.whitehouse.gov/onap

This paper will examine the hybrid methods of our public history meets participatory design approach to working with HIV survivors in producing multimedia books, short films, and traveling exhibitions [Figures 1 & 2]. Discussion will include observations on the nature of "care" that we believe this process has produced—a form of care distinct from the medical variety. We will conclude with perspectives on new questions and opportunities for similar participatory public projects related to public health and well-being.

## Methods

Our hybrid methodology is modeled on the mixed capacities and "shared authority" (Frisch) of all participants. Together we transform personal narratives into dense concatenations within which patterns and linkages are made explicit—making histories of violence and structures of vulnerability visible to contemporary and distributed audiences. Mobility is considered not only in spatial terms (e.g. traveling exhibitions or digital media) but also in terms of mechanisms employed for mobilizing this "shared authority" in the construction of historical narratives. This form of mobility requires intimacy and face-to-face, rather than face-to-screen, interactions [Figures 3 & 4]. History Moves creates spaces of mutual trust and shared authority to enrich each project's collaborative capacities while generating the "thick descriptions" (Latour) necessary to carry the personal into the structural.

As oral history practices are not considered "research," the project's home institution has exempted it from IRB review. Regardless, we conduct an extensive process of "ongoing consent" in which participating women grant consent to every output, be that in printed, audio, video, or exhibition form.

## Results

The tangible culmination of these efforts is a multimedia exhibition specifically designed for collaborative curation, creating ongoing opportunities for the women to work with the project team and each other in curating the exhibition for each exhibition venue's unique context. Meanwhile, the project's growing archive is being developed into a

web-accessible interface designed to replicate the nonlinear nature of conversation—a reflection of the oral history beginnings of our project.

## Conclusion

"HIV saved my life" may not be words epidemiologists like to hear, but it's a sentiment we encounter frequently with HIV survivors. For many of these women, an HIV-positive diagnosis provided a cadre of care previously unknown in their lives (of course, no one ever said "Medicaid cuts saved my life," or "Reagonomics saved my life!"). It has become evident that our process generated a new form of "care" for victims of personal and structural violence: by listening, amplifying voices, granting authority in decision-making, and crafting artifacts and experiences of the highest aesthetic quality as demonstration of that care.



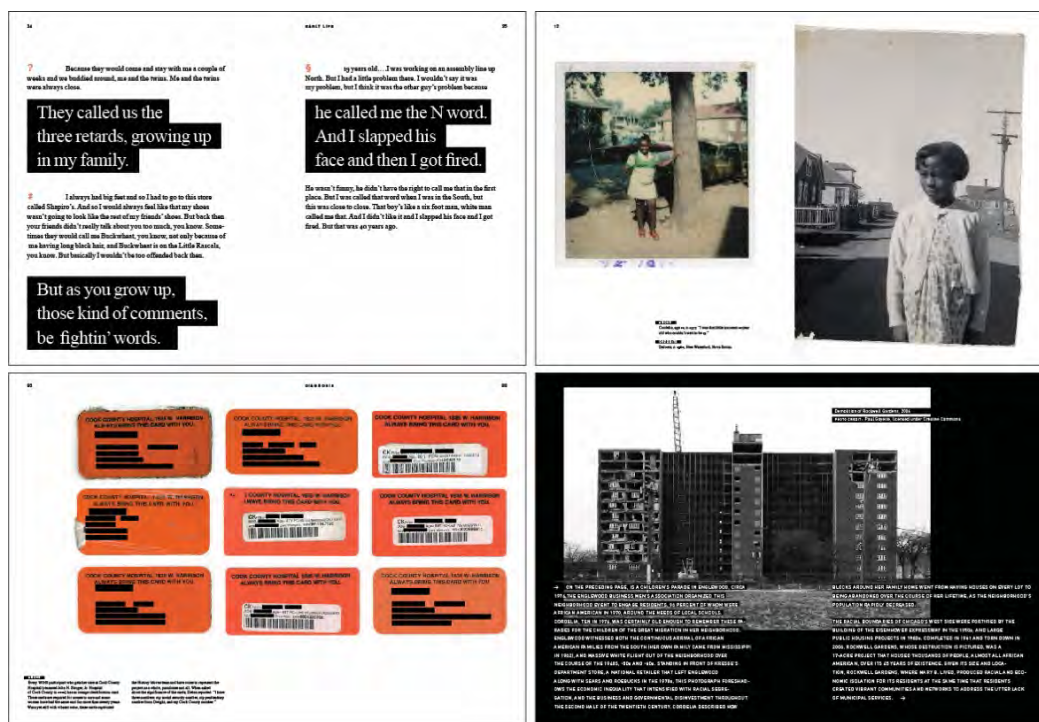**Figure 1. In Plain Sight, mobile exhibition (Dec, 2015).**

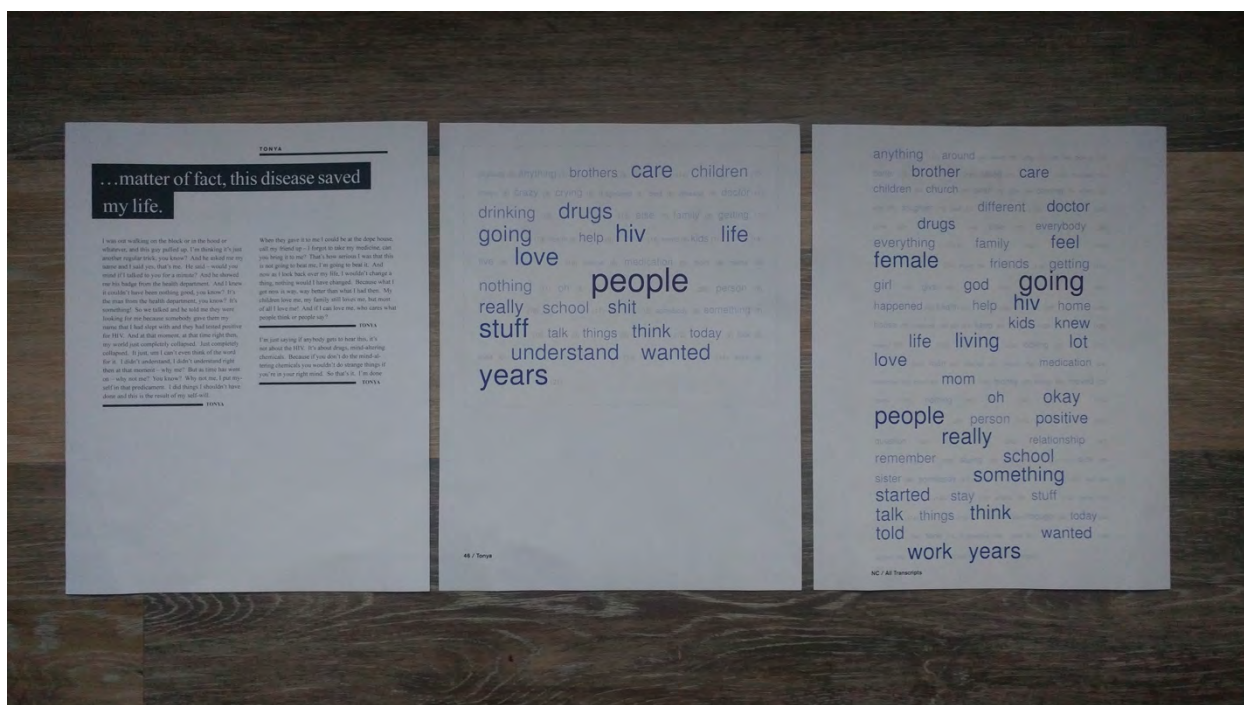**Figure 2. I'm Still Surviving, book (Dec, 2015).**



**Figure 3. Participatory workshop materials, WIHS North Carolina (Apr, 2017).**

**Figure 4. WIHS Brooklyn workshop (Oct, 2016).**

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# Using Knowledge Mobilisation theory to inform the design of a co-design workshop for healthcare research and innovation

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## Keywords

Knowledge Mobilisation, Co-design, Implementation

## Introduction

The intersection of design and health allows the flourishing of practice driven by and drawn from other disciplines. In this paper, we explore the contribution of understanding drawn from the theory of Knowledge Mobilisation within health on and through the practice of design; specifically, the practice of co-design workshops as a means to develop and deliver new insights and knowledge.

## Background

Knowledge Mobilisation in health care initially attended to the challenge identified that the time between the findings of research being available to the time the findings were implemented into routine clinical practice was too long. In the apocryphal tale, there was some 15 years between the benefits of subcutaneous Clexane, a preventative measure to reduce the chance of deep vein thrombosis, being identified and it becoming common practice in hospitals. Knowledge Mobilisation and the study of knowledge Mobilisation (sometimes called Implementation Science) sought to explore and test the different approaches to this process and generate theoretical understanding of what worked and what didn't work (Nilsen et al. 2015). As the science advanced, so did the understanding of the thing that was being studied. What was originally perceived rather crudely as academics in ivory towers throwing their knowledge into the swampy lowlands (Schön 1983) of front line professional practice, prompted the realisation that there was a need to better understand contextually specific processes, that were difficult to describe without understanding the who, where, what and why.

This has been more elegantly described by Gibbons as a shift from mode 1 to mode 2 research (1994). Mode 1 being the creation of research by academics which is then 'translated' to end users. In contrast, Mode 2 research is generated where it will be applied and by those who will apply it, and therefore by dint of its generation must recognise and accommodate the views of a range of stakeholders. The emergence of mode 2 knowledge creation also coincided with the recognition of complexity and uncertainty in science and society with some arguing that this approach of bringing

multiple perspectives together to approach these 'wicked problems' to which there might not be a right answer may be a successful strategy (Buchanan 1992).

This co-creation process is also described in practice as well as in the literature as coproduction, of which there are well-documented levels of participation. (Arnstein 1969; Wilcox 1994)

# Design Practice

It is against this background that we position the relatively young discipline of design research. Design and specifically in this instance co-design methods, have sought to use a range of practices to allow stakeholders to come together to design the best product, service, system, communications etc. to meet their needs and desires (Manzini 2017).

Through the practice of Lab4living (www.lab4living.org.uk), at Sheffield Hallam University in the United Kingdom and User-centred Healthcare Design (www.uchd.org.uk) we have built up 10 years' worth of experience of doing design in health care using co-design approaches to participatory research, service improvement and service re-design within healthcare contexts. It is through this practical experience that we feel that design is able to respond to the challenges and opportunities of co-creation as defined in the literature. Whilst we cannot address all the literature in this abstract we will focus on 3 key areas identified as being particularly problematic in the practice of coproduction where creative and participatory practice has a role to play:

# Power relationships

Whenever we bring people from different backgrounds together in a group setting there are issues of power. These issues are magnified in health and social care where patients are invited to work alongside professional staff of different types. Patients tend to presume expertise on behalf of professional staff rather than recognising their own expertise gained through their own experience. In workshops, we try to prioritise methods that do not preference 'professional' ways of working. Through creative practices and visual methods, that don't use spoken and written language as the dominant approach, we are able to facilitate the sharing and better understanding of all the views of the members of a broad and diverse group.

# The bringing together of different world views

It is recognised that reconciling different perspectives is challenging to do, often the issue of sector specific methods and processes, professional language and use of acronyms can limit meaningful engagement. By using methods that make visible or tangible the subject being explored we have found that participants can better see and understand what is being proposed or discussed. This is further supported through iterative, participatory, prototyping processes ensuring that the activities and outputs of the workshop embody the knowledge of all participants. Our argument is that through a process of participatory making, we allow different forms of knowledge to emerge.

## A systems approach, reframing

The literature suggests that in order for co-production to be successful for Knowledge Mobilisation a systems approach needs to be taken. Creative practice and specifically design encourages this approach with a set of methods that encourage a broader challenging of the 'problem' from different and often competing perspectives. Often activities will allow participants to step back from what they feel the problem is and together explore broader determinants and therefore to imagine different solutions. This reframing of the problem speaks directly to the co-creation, mode 2, Knowledge Mobilisation approach that recognises the context and social interactions that make up most health and social care interactions.

## Conclusion

Knowledge Mobilisation, design and creative practices are not usual bedfellows, but from the practice of applying methods from design in health to health and social care projects over the last 10 years we have seen the benefits of this conflation. From the academic discourse around Knowledge Mobilisation and its study we feel that the practice and theory reinforce each other and that designers can be confident that their methods can address challenges to more traditional approaches of delivering meaningful engagement and therefore better services and care for society. This paper will unpack details of Knowledge Mobilisation, design and creative practices relationships through case-study exemplars.

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# Improving the blood donation experience through better designed phlebotomy.

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## Keywords

Blood, Donation, Experience, Phlebotomy

## Introduction

Blood transfusion from a healthy population to provide essential aid to a variety of life threatening clinical conditions is a significant public service. In Australia, only 1 in 30 people donate blood on a regular basis but 1 in 3 people will require a blood transfusion in their lifetime (Australian Red Cross Blood Service 2016). The primary method of obtaining blood in Australia is by voluntary donation. This is viewed as an act of charity and a symbol of community spirit. The Australian Red Cross Blood Service (ARCBS) runs the donation and blood bank service. Australian blood donations go through very strict testing process before it is given to the recipient. Unless more Australians donate blood, imported products will be needed to meet the shortfall in Australia.

Encouraging people to become repeat donors is a national problem. Of the 9 million Australians eligible to donate, currently only 500,000 do (Australian Red Cross Blood Service 2016); 25,000 blood donations are needed every week (Australian Red Cross Blood Service 2016) and blood needs to be collected every day of the week. Blood products have short shelf lives; platelets 5 days and red blood cells 42 days. Plasma may be frozen for up to 24 months. In 2003, the federal, state and territory governments signed the National Blood Agreement, committing to the manufacture and supply of blood and plasma-derived products solely from blood donated in Australia. A review in 2014, found the volume of plasma collected from Australian donors needs to significantly increase to meet future demands for plasma-derived products.

## Reasons for poor donor retention.

While it is generally recognized that donating blood is a public good, following through and becoming a donor and importantly a repeat donor remains a significant challenge for the ARCBS. There are a significant number of papers, reports and articles in the academic literature that cite reasons for this. Many point to situations or occurrences of negative experience, as stated in table 1.

Table 1. Reasons for poor donor retention.

| 1 | Fear of needles (Holly, Balegh and Ditto 2011). |
|---|---|
| 2 | Painful (Holly, Balegh and Ditto 2011). |
| 3 | Seeing the blood removal (Holly, Balegh and Ditto 2011). |
| 4 | Fear of the process (inadequate knowledge about blood donation) (Lemmens et al., 2005). |
| 5 | Waiting (Fergunson 1996). |
| 6 | Speed of apheresis donation too slow (Fergunson 1996). |
| 7 | Less needle sting (Fergunson 1996), heated saline bag for plasma return. |
| 8 | Repetitive paperwork and questions, repeated waiting around (Fergunson 1996). |
| 9 | Process too long (Fergunson 1996). |

Temporary deferrals and diverse events had the strongest negative impact (Custer et al., 2010; Hillgrove et al., 2012; Masser et al., 2009), with phlebotomy as the most frequently reported negative experience. This is the moment of pain when the needle is inserted to the donors arm and is cause of anxiety and discomfort. While this in healthy donors is a mild localized trauma to the arm, poor needle placement or severe psychological apprehension can render the experience unpalatable. Further research shows that one unit of negative performance is likely to have a greater effect on subsequent donation behavior than a corresponding unit of positive performance (Timothy et al. 2013). This has become the focus of research, particularly in the design of the interface between donor and transfusion.

Research at Monash University in the faculty of Art Design and Architecture (MADA) has examined this interface closely to mitigate the current negative impact of the phlebotomy process. The result has been a conceptual design intervention that responds to the anxieties potential new and repeat donors in the form of a product and system experience design.

Firstly, the area of arm receiving the needle is locally anaesthetised using the same chemical compounds found in the saliva of leeches. Finding and hitting the vein is enabled through infra-red light displayed in a viewfinder. This utilises deoxygenated blood to give clear indication of the vein location and enable 85% accurate phlebotomy (Cummings et al 1996, Basadonna 2016). In the hands of professional staff, who already have an average accuracy of 86% (Pandey et al. 2007), there is greater confidence that the donor experience will be improved. Finally, these components are held in an entirely enclosed 'sleeve' that hides the moment of extraction from view of the donor as well as enabling the donor to hold more securely in the optimum position for blood flow and comfort (see appendix).
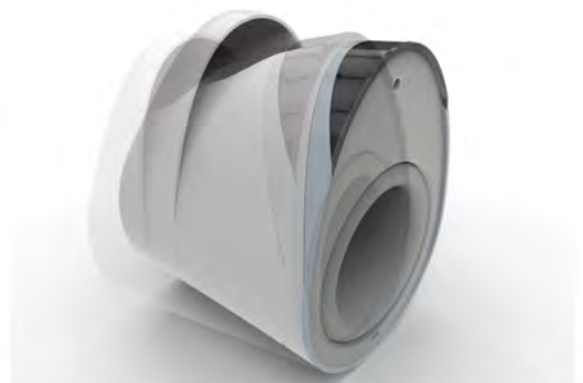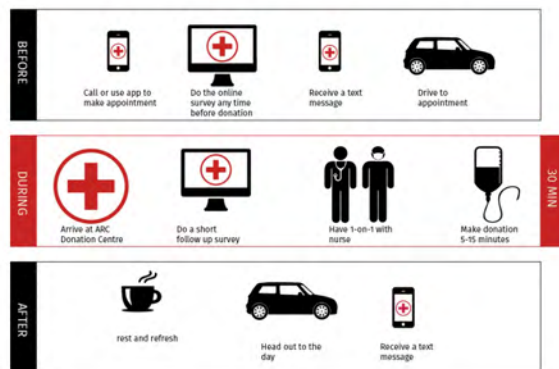
## Conclusion

Blood collection for the purposes of transfusion is a vital part of the community health. Demand for blood far exceeds donations. Research has shown that the experience of giving blood is tainted with a variety of anxieties and discomforts, the most central of which is the insertion of the needle into the arm. Research into the design of better phlebotomy indicates that improvements can be made and a conceptual response created at Monash University MADA is demonstrating the validity of this focus. Challenges in the development of such a product and system remain, but indicate that they are worthy of further research.
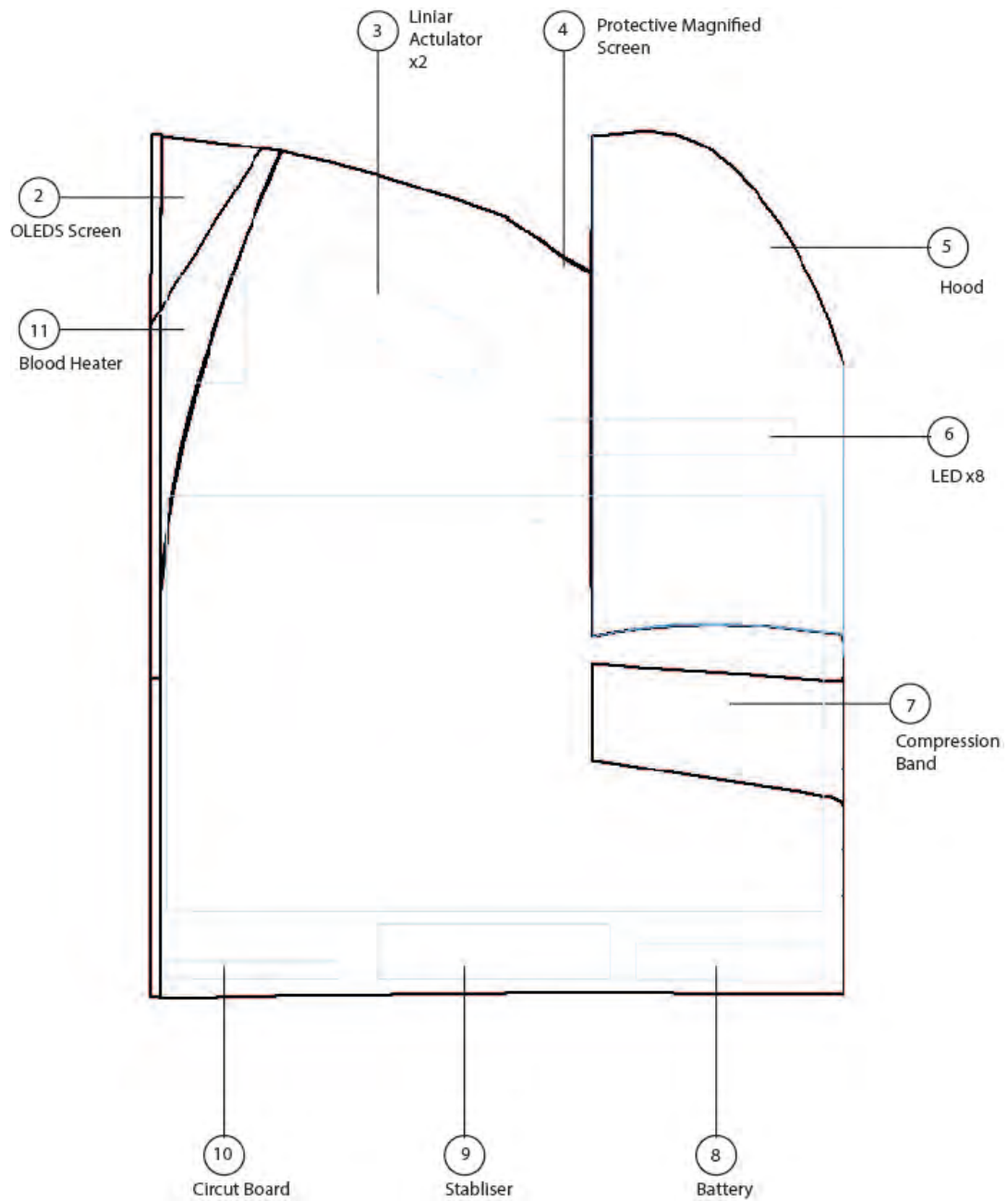
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# Appendix

# Appendix 2. Interior Components.



3 — Liniar Actulator x2

4 — Protective Magnified Screen

2 — OLEDS Screen

5 — Hood

11 — Blood Heater

6 — LED x8

7 — Compression Band

10 — Circut Board

9 — Stabliser

8 — Battery

# Actualising the participant designer: a case study in the design of health communications

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## Keywords

Health promotions, Participatory Design, Urinary Incontinence, Teenage girls, Designer Facilitation

## Introduction

This paper discusses the use of Participatory Design (PD) to develop a campaign for teenage girls on pelvic floor health. Working on a sensitive topic with young participants highlighted some fundamental considerations about the nature of participant's involvement in PD, with implications for the development of marketing campaigns that seek to raise awareness of health issues and motivate behavior change.

Urinary incontinence (UI) creates major health care costs and significantly reduces people's quality of life. Female gender is a risk factor for UI, 85% of those affected being women (Fantl *et al*., 1996). UI increases with age, but more than 50% of women living with UI are under 50 (Bardino *et al*, 2015). The scale of UI as a health issue for women sees the medical literature arguing that young women should be targeted by public health initiatives to increase the practice of pelvic floor exercises, a preventative measure against UI (e.g., Landefeld *et al*., 2008).

## Literature Review

Health communications have a key, if contested, role in disseminating health education. Sharf (2001) argues for health communications to be more concrete and relatable for people, while Kanstrup *et al.* (2008) contend that clinical perspectives often overwhelm the needs and outlook of target audiences. A social marketing perspective holds that leveraging audience's attitudes and experiences is more effective in health communications than focusing on information and negative outcomes (Donovan, 2011). Increasingly, a participatory approach in developing health promotions is preferred in connecting audience knowledge and understanding to responsive actions (Israel, Schulz, Parker & Becker, 2001).

Women of all ages lack awareness of UI (Tremback-Ball *et al.*, 2008), but knowledge is almost negligible in young women (Carls, 2007; Figuers *et al.*, 2008; McAlpine & Thow, 2001). Those experiencing UI appreciably under report their condition, leading to major under treatment (Norton & Brubaker, 2006). For Howard-Thornton (2007), it is vital to understand young women's views on UI in developing health promotions for this audience; in the late teens, girls experience significant physical, psychological and social

changes (Wilson *et al.*, 2015), while the stigma around UI is closely associated with anxiety, embarrassment, low self-confidence, negative body image and poor self-esteem (Rozensky *et al.*, 2013).

## Research Method, Design Workshops, Participants

To understand young women's knowledge and attitudes on UI, we held five PD workshops with a total of 19 participants aged 15–19. The workshops were styled as a design team at work, having three main activities: 1) persona development to model how young women might experience UI; 2) reviewing existing designed communications on pelvic floor health; 3) devising communication strategies for pelvic floor health awareness. Concerned our presence would constrain discussion, after introducing the workshop we left the participants to interact with the workshop tools (e.g., Table 1), returning briefly to prompt each activity. Participants' conversation was audio-recorded and transcribed. Visual materials were retained and scanned. Thematic coding of the data focused on participants' awareness of the pelvic floor, stigmatisation of UI and receptiveness or aversion to information on pelvic floor health.

**Table 1. Persona cards**

| Card | Name given and frequency of use | Card | Name given and frequency of use |
|---|---|---|---|
| | **3 personas**<br><br>Sophie, 17-years-old<br><br>Brittany, 15-years-old<br><br>Alyssa, 19-years-old | | **Unused** |
| | **4 personas**<br><br>Elisa, 15-years-old<br><br>Skye, 17-years-old<br><br>Misha, 18-years-old<br><br>Tara, 16-years-old | | **5 personas**<br><br>Kate, 20-years-old<br><br>Sam, 17-years-old<br><br>Jodie, 16-years-old<br><br>Violet, 16-years-old<br><br>Maddy, 14-years-old |
| | **2 personas**<br><br>Alannah, 15-years-old<br><br>Khloe, 16-years-old | | **2 personas**<br><br>Hanna, 17-years-old<br><br>Melanie, 21-years-old |

| | **3 personas** |
|---|---|
| | Becca, 20-years-old |
| | Alessandra, 23-years-old |
| | Charlotte, 16-years-old |

# Results and discussion

The workshops identified valuable strategies for communicating pelvic floor health to teen girls, but the efficacy of the approach to PD was also significant for understanding the designer's role in PD. There is tension in the PD field between the social-historical genesis of PD in values of democracy and user empowerment and the pragmatic application of PD in mainstream product and service development and improvement (Sanders & Stappers, 2008). Sections of the PD literature uphold Greenbaum and Madsen's perspective that 'people have the right to influence their own lives' via design (1993, p. 47). Closely allied to this is the sense that establishing the range of user experience within the design process leads to empathetic design that serve people's needs and interests (e.g. Binder *et al.*, 2011; Mattelmäki & Sleeswijk Visser, 2011). However, the PD literature also reveals a growing instrumentalism in the focus on PD tools and facilitation techniques, raising questions about who initiates action in PD and for what reason, who defines a problem or need and whose interests are at stake in the design process, all vital matters in the use of PD within health communications.

Marzzone, Read and Beale (2008) argue that available PD tools and techniques are poorly suited to the challenge of PD with teenagers, failing to address issues like low motivation to focus, disruptive behaviour and intermittent attendance. Our results suggest that for teens, less designer presence in the design process significantly boosted the scope for self-organization, open communication and self-actualisation. Beyond the design activities, the participants were largely free to determine what happened in the workshops. This proved to be highly effective in identifying barriers to communicating pelvic floor health and ways to address these (See Figure1). Without hovering designer-facilitators, there was frank talk, laughter, singing. Pelvic floor exercises were tried. Workshop activities prompted wide discussion of UI as well as participants' views on menstruation, pelvic pain, school toilets, friends, favourite TV shows, plus sports, pastimes and their relationship to UI. We learned what the girls found cringe-worthy about existing communications and that if you could capture their attention, they found information about the pelvic floor relevant and interesting.
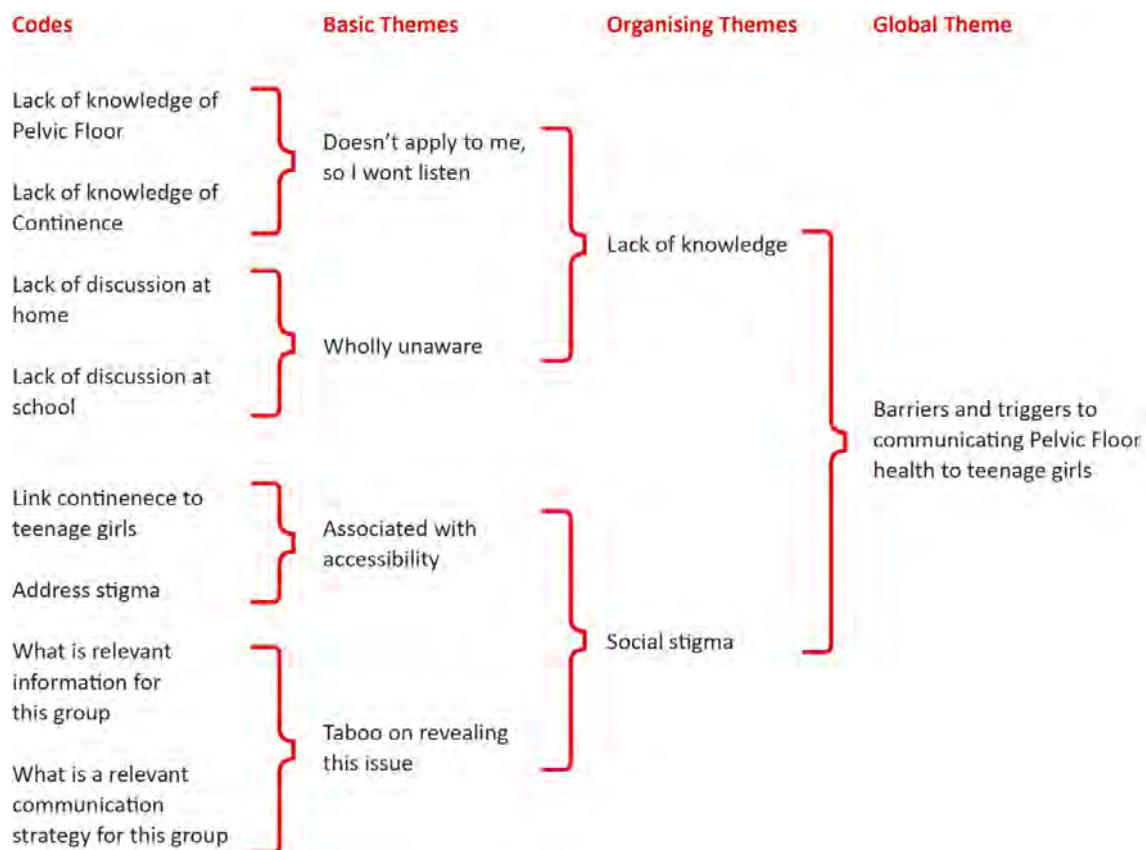
**Figure 1. Workshop findings**

# Conclusion

The participants identified humour combined with challenge as the best way to tackle the stigma and silence around UI. A pervasive aim across the workshops was communication strategies that create a sense of sisterhood and solidarity among young women. By the end of the workshops, the participants were empowered through new knowledge, one commenting that she "couldn't wait to discuss the workshop at the dinner table". The workshops revealed a model of relational creativity in PD based on voluntary participation in the moment to produce rich outcomes that should be explored further.

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# Playscapes: Pure Ludens

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## Keywords

Play, Children's healthcare architecture, Hospital design, Colour, Co-design methods

## Introduction

Intuitively, we play. Cultural theorists Johan Huizinga and Brian Sutton-Smith (1997) discuss the ambiguous nature of play and its relation to space. Play is more than just a frivolous activity or playgrounds and theme parks; it is how we—and especially children—can discover and engage with our environment. Spaces cannot force play, one of Huizinga's (1955) conditions for play is that it must be a free choice, but spaces might inspire someone to want to play.

But what happens when play is situated in the very ordered structure of a hospital? This practice-led research asks how can an enquiry into play activate therapeutic hospital environments through empathy, imagination, and re-enchantment?  To consider this, we explore the tension between the highly regimented hospital environment and the unregulated nature of children's play through play theory, drawing methodologies and colour. This paper describes findings and research to date and how these might be folded into a design proposition

## Site and Existing Environments

This research is a collaboration between Starship Children's Health[1] and the Design for Health and Wellbeing (DHW) Lab. The DHW Lab is a collaboration between Auckland University of Technology (AUT) and Auckland District Health Board, located at Auckland City Hospital to design to improve healthcare experiences with patients, their families and staff (Reay et al. 2016).

This project is situated in three connected public spaces of Starship Children's Health— the atrium, a small garden, and a mezzanine with a café. The atrium is a multipurpose environment available to people in various situations or emotional states at all times of

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[1] National children's hospital in Auckland, New Zealand

the day and night. Access to outdoor spaces such as the garden suggest that these holistic wellbeing intentions were in the original Starship design but not maintained. Familiar food outlets (mezzanine) were also intended to make the hospital feel less isolated from civic activities (Kearns and Barnett 2000). They were intended to cater for families, however, staff interviews found that these spaces are underused, cold, dull and uninviting for patients and their families.

## Theoretical Frameworks

To address these ideas at Starship, this research first looks at complexities in healthcare spaces. Hospital design is moving in a direction that mediates hierarchies between doctors and the medical machine, and patients (Wagenaar 2006, 41). One such way to empower patients is applying a holistic notion of wellbeing and acknowledging the effects that environmental factors have on healing. Geographer and health space critic Wilbert Gesler (1993) considers the influence of health care spaces and "therapeutic landscapes" for patients receiving treatment. These spaces may include landscaping and appeal to our biophilic tendencies, space for spiritual connections, spaces for family, and opportunities of personalisation.

The rigidity of institutionalised medicine is also juxtaposed with the nature of free, unregulated play. Play and play therapy can be a medium to communicate with children in a way that they are familiar with in an often intimidating setting. Children in hospitals have many things decided for them or procedures done to them, whereas play is something they can control and is used as a form of escape or distraction from the clinical aspects of a hospital. How might a notion of play in the design improve patient experience?

## Methods

These themes are explored through drawing methodologies and colour. Qualitative data collected by way of interviews and a design workshop supports the need for inclusive processes to incorporate perspectives of the space's primary users (child patients, families, and staff).

Extending the site analysis beyond the confines of the hospital to the neighbouring Auckland domain reveals the histories of the site and its streams and springs, adding a geographical connection to the hospital (Figure 1). Along with research on cultural contexts, this research shows how holistic wellbeing should be considered as an intrinsic part of the design process.

**Figure 1. Extended site mapping-history and geology**

# Playfulness through colour



**Figure 2. Existing Atrium interior walls**

The Starship atrium is lined with five pastel colours that carry significant meanings: pink= health and wellbeing, blue=sky, aqua=sea, orange=land, and yellow=sun (Figure 2). The original design intent was to make each level themed to one of these colours and the ground floor would be an amalgamation of all them. Currently, the de-saturated pastel tones from its opening in 1991 make the space appear outdated and dull. Precedents of

children's hospitals constructed in the last ten years still use multiple colours but in brighter tones, and it is balanced with more white/neutral colours so it is not overpowering or over-stimulating. Colour theory estimates how colours are experienced while acknowledging that each person's perception of colours may differ.
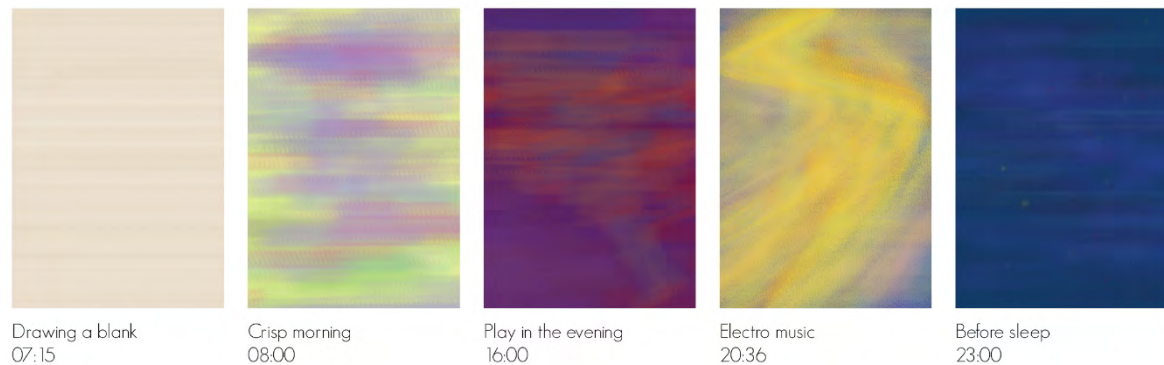


| | | | | |
|---|---|---|---|---|
| Drawing a blank 07:15 | Crisp morning 08:00 | Play in the evening 16:00 | Electro music 20:36 | Before sleep 23:00 |

**Figure 3. Synesthetic colours at different times of day**

Initial exploration of assumptions around colour resulted in playful cross-sensory visual colour cards (Figure 3). These are further tested through a co-design workshop with children at Starship to gain insight into how they view their experiences and ask what kinds of play are meaningful to them. Colour, material and lighting are also considered by how it may affect our body's circadian rhythms, and possible cross-sensory links to mood, colour, and time.

# Conclusion

These findings examine the value of play in a children's hospital design. It is also specific to cultural and geographical contexts of New Zealand. User-experience and input are at the core of the design process, emphasising how an understanding for the site and people can lead to an empathetic design proposal response.

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# Strength for task training (STT) exergaming for lower limb stroke rehabilitation

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## Keywords

stroke, lower limb, rehabiltiation, exergame system, augmented reality

## Introduction

The success of stroke rehabilitation requires the patient engage in early, long-term high repetitions and intensive treatment. When comparing clinical and literature statistics, it is confirmed that clinical rehabilitation is not achieving required repetitions and intensity for effective rehabilitation of basic motor skills as prescribed in physiotherapy literature. (Jurkiewicz, Marzolini, and Oh 2011, 277-284), (Lang et al. 2009, 1692-1698), (Lohse et al. 2013, 166-175), (Alankus et al. 2010, 2113-2122). It is then the patient's responsibility to carry out the rehabilitation at home without supervision. However, the patient's motivation is vital to carry out exercises and patients have various sources of motivation such as the patient's understanding of the purpose rehabilitation (Maclean 2000, 1051-1054). Exergames have been found effective to improve patients' engagement with their therapies at home. (Alankus et al. 2010, 2113-2122), (King et al. 2012, 128-135), (Deutsch et al. 2009, 117-120), (Mortazavi et al. 2014, 449-456), (Shirzad et al. 2016). Design literature suggests that it is possible to facilitate use and engagement to produces, particularly medical devices, through their design (Rodríguez Ramírez 2012, 2006, 2011, Rodríguez Ramírez and Chan 2013, 2016).

## Design Research

Currently there are exergame systems to promote lower limb stroke rehabilitation such as Youkicker, VirtualRehab Body and AbleX system, but none facilitates Strength for Task Training (STT) (Signal. 2014). STT is a novel physiotherapeutic method for lower limb rehabilitation and comprises of two main phases: first being the strength training (priming) and second being the task training. Priming is brief weightlifting to excite the neural pathways (neuroplasticity) in the affected region, which primes the brain for learning; this is then promptly followed by task training to maximise gains in the locomotor ability.

## Design Outcome



**Figure 1. Home-based Strength of Task Training Exergaming System**

This project presents the development and testing of a set of game controllers as part of a complete exergaming system (figure 1) which was designed to specifically facilitate STT. The final output is a pair of prototype shoes which included a sensor to measure movement, a pair of weighted ankle braces and a pair of balance soles. The weighted ankle braces are customisable and help facilitate the strength part of the training. The shoes safely carry the sensors and help them charge them intuitively through a charging station that looks like a shoe rack. The sensors translate limb movement and are for the user to interact with the game. The shoes are also the adaptors which allow the user to either attach the weighted sole for strength training or the balance sole which is used to constantly challenge the user's balance. This system provides a simple and safe method to engage (Alankus et al. 2010, 2113-2122) in unsupervised STT at home.

## User Testing

Clinicians had approved the usability of the designs, we carried out two testing sessions with stroke patients. The designs were iterated and new prototypes built after each session We carried out several iterations of testing with clinicians and stroke patients. Due to ethics requirements by the Health and Disabilities Ethics Committee, we first developed and tested the design concepts in several iterations with stroke clinicians, including three neuro physiotherapists, one senior nurse and one occupational therapist. Once the with clinicians and patients. The stroke patients were three males and two females, ages ranging between 40 and 80 years old. Each testing session of the full system including the exergame lasted one and a half hours, with independent testing

of the shoes, brace and soles lasting between 30-45 minutes. Participants were asked to put on the shoes and attach the soles and the brace without prompting of how to do it (naive testing). During the last testing session with stroke patients, they were guided solely by the interface with the exergame. We asked participants to verbally describe their actions (Thinking Out Loud) as they were interacting with the objects. They were also asked to play the exergames. After the testing, we used semi-structured interviews and a System Usability Scale (SUS) to assess the shoes and the games independently from each other.

## Results

Feedback from users and clinicians indicates that the shoes can facilitate the strength part of the exercise, the sensors the task part of the training, and the balance sole is useful for challenging and improving balance. However, the soles need more weight to reach a one-repetition-maximum. User testing sessions suggest that the shoes are easy to use with an intuitive design; the aesthetics of the physical objects was favourable by most participants and avoided stigma often related to rehabilitative devices; and most participants felt that the system would help them engage more in their therapies.

## Conclusion

We concluded that the system can facilitate part of STT. However, feedback also showed that the system needs to consider the customisation of the shoes, as stroke patients may have contractures or foot drop that changes the shape of their feet. Participants were divided about whether they would wear the shoes outside of an exercising environment (home, physio clinic or gym), and customisation could also help with addressing different aesthetic preferences. These points strengthen our suggestion to produce the system through digital manufacture, particularly 3D printing. Finally, further research should investigate how to facilitate strength exercises that reach a one-repetition-maximum in the easiest and most engaging way, without the need of Therabands and other complex items to use.

## Acknowledgements

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