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The Craft of Wearable Wellbeing

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Abstract

As the fields of wearable health devices - from fitness bangles to exoskeletons - are rapidly expanding, the notions of wearability, wellbeing, style and personal identity need to be better understood by those designing them. By acknowledging the experience and expertise of the wearers of such devices and including them in a co-design process, insights into these supra-functional needs can be generated and developed and incorporated into the design (McDonagh 2006; Hassenhahl, 2013). Wearable health devices are traditionally designed within a biomedical model. This emphasis leads to the design of objects that do not address the psychological and social impact upon the wearer, and so produces artefacts that wearers often perceive as unwearable and unstylish, resulting in low adherence towards the device (Fess & Philips, 1987; O'Brien, 2012).

This paper looks at PhD practice led research into wrist support design that engages with patients' experience of the concepts of wearable and wellbeing through their participation in a generative co-design process (Sanders & Stappers, 2012). Data is generated from the patients to inform and inspire a design process that is based within a framework of contemporary jewellery. As a co-design project (supported by the Hypermobility Syndromes Association (HMSA)), seven women with Ehlers-Danlos Syndrome participated in a workshop using generative techniques such as model-making and storytelling.

Using a biopsychosocial model (McKee & Rivard, 2011; Engel, 1977), the analysis of the data highlights the relationship between the artefact, the wearer, supra-functional needs, wearability and wellbeing. In addition, by integrating a craft sensibility to the design, a new hybrid artefact is developed: Therapeutic Jewellery, which is people-centric in its embodiment of style, identity, wearability and wellbeing alongside medical function. A series of such artefacts are crafted, and a model for their future design is proposed, to further engage the wearer (patient) in the process.

Keywords: wearable medical device design, co-design, contemporary jewellery, therapeutic jewellery.

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Introduction

This paper looks at PhD research that explores the design of wearable medical devices within a framework of contemporary jewellery in order to improve the wellbeing of the wearer. It focuses on the design of a wrist orthosis -an orthopaedic device for the immobilisation, restraint or support of the body (Glanze *et al,* 1990). The issues of splint design are similar to issues in the design of all wearable medical and fitness devices, in that they are traditionally developed within a biomedical model that does not allow for the psychological and social impact of wearing these devices to be addressed by the design, and leads to low adherence towards the device by the wearer.

The research highlights the need for issues such as wearability and emotional engagement to be addressed for such devices to fit seamlessly into the wearer's life. The paper concludes with the posit of a new hybrid object: Therapeutic jewellery, in which functions for jewellery objects are incorporated into the people-centric design. A proposed model for their future design, as a digital health project, demonstrates a co-design approach for the craft of these artefacts, employing both analogue and digital technologies.

Context

Wearable medical devices are prescribed to improve the health of the wearer to monitor, support or offer prosthetic function. Yet wearers have poor adherence to their prescribed use. A number of factors have been identified that lead to the poor adherence to the wearing of splints (Fess & Philips, 1987; O'Brien, 2012;) and include: unsuitability of the splint for patient; difficulty to remove; discomfort; aesthetically unappealing; and impractical for task or environment. (Paterson, 2012) Further reasons offered by respondents to this research include feeling stigma, and poorly performing materials. A more encompassing view of wearability could include factors found in jewellery objects such as desirability, and the transformative power of the relationship between object and the wearer.

The research hypothesises that wearable medical devices are designed for a medical body and have a medical register yet they are worn in everyday life. Rather than this biomedical approach to their design, a biopsychosocial approach is proposed that can consider all aspects of a person's wellbeing and not simply their physical health. Wellbeing in this context is defined as when "individuals have the psychological, social and physical resources they need to meet a particular psychological, social and or physical challenge." (Jackson, 2013).

A further hypothesis is that a process based in an experience and empathy design approach would better serve this biopsychosocial model of design. This is supported by McDonagh's assertions of a need for a balanced approach to both functionality and supra-functionality (a set of complex emotional, spiritual, social, tribal aspects of the relationship between object and person (McDonagh, 2006). A craft sensibility could provide further insights into understanding the cultural and personal

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significance of this worn object, through the exploration of material and process (White & Steel, 2007).

Clinicians have advocated for a biopsychosocial approach stating it should be: "individualised, with consideration of the person's unique biological or physical and psychosocial needs, personal factors; and unique context, including life roles and environment" (McKee *et al,* 2011). Yet the reality is very different, with a limited range of off-the-shelf supports available; and customized devices fabricated, by a hand therapist using thermoplastic materials. The only other personalisation of these objects is a choice of colours from a limited colour palette.

Another development is the use of digital technology for the fabrication of medical devices. The increasing global availability demonstrates how digital technologies have democratised the tools of invention and production (Anderson, 2013). Crafts people have also been able to engage positively with this technology (White & Steel, 2007; Neidderer & Townsend, 2010), suggesting that a future digital health project, where the fields of craft, design and medical knowledge are synthesised, could be feasible.

Finally as part of their craft, the contemporary jeweller is practised in engaging with a wearer and designing a bespoke piece of jewellery. Alongside the considerations of wearability and desirability, a contemporary jewellery framework can enrich the understanding of worn objects. As Wallace, Dearden and Fisher state:

> It moves focus away from location on the body to question our relationships to objects, the body, our environment and each other. In extension Contemporary Jewellery develops a discourse about relationships: between self and object, individuals and groups, maker, audience and practice.
>
> Wallace *et al,* 2007

This understanding along with medical functionality supports the development of people-centric devices, in which a synthesis of craft, wellbeing and medical knowledge leads to an understanding of the worn object and the meaning of wearable that extends beyond simply a location on the body.

Approach

The research stage at the front end of the design process has the aim of generating data to inform the design process. The design of a collection of Therapeutic Jewellery followed an analysis of this data, as described below. The research contained two elements: 1. A scoping exercise: consisting of a series of questions posted on social media. 2. A Co-design workshop: Participants attended a three-hour workshop where they participated in generative exercises (Sanders, 2002; Sleeswijk *et al*, 2005). All respondents were recruited with the support of Hypermobility Syndromes Association

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(HMSA). This client group has Ehlers-Danlos Syndrome, a connective tissue disorder, and all have experience of wearing medical devices including splints.

The key aims of the workshop were: 1. To generate data that informs the design process. 2. To identify design methods to apply to the design of therapeutic jewellery. 3. To explore device concepts that are more desirable for the wearers. The first exercise asked the participants to use a given set of images and words and make a collage in box form (see figure 1) that would express how they felt about their wellbeing. On completion, they then shared their stories with the group.

Figure 1. Four sides of one participants collage box. Her health story begins with the image on the left and finishes with the fourth box-side on the right.

The second exercise entailed the making of individual 3D models of a wearable health device of the future, using a range of modelling materials (see figure 2) and to share their models with the group. All the exercises were recorded and data retrieved was rich and varied. Although the data analysis is still in an exploratory phase, ways were explored to analyse the data and to classify the data into meaningful information (Sleeswijk *et al,* 2005; Sanders & Stappers, 2012) A three-phase structure was used for the generative data analysis.

Figure 2: Images showing wrist models from two participants of the generative workshop

The research stage is bridged by the data analysis into the design stage. As findings are considered in the following section, what continues here is a descriptive overview of the design work. The main aim in this stage was to work with a range of technologies, within a contemporary jewellery framework. A wrist support was chosen since the wrist is an archetypal location for jewellery.

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In order to test for fit, the researcher chose to design a series of splints for own wrist. This was seen as more convenient for the provisional design process where constant checking for fit was required. A first step was to take a series of plaster casts of the wrist. These casts were then employed in two ways. First, one was scanned for use with CAD programmes, and designs were then built upon the scanned wrist (see figure 4) directly within the CAD environment. Secondly, the casts were directly worked upon as formers with a range of materials. From this process, a series of models was fabricated which were then tested on the researcher's own wrist to check for wearability and functionality.

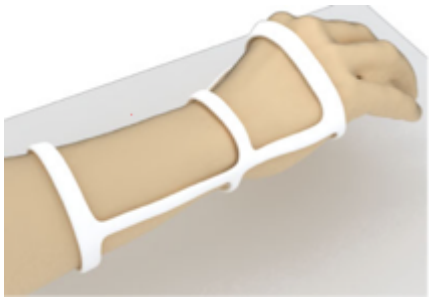

Figure 4 Render of scanned wrist with scaffold device, on to which panels can be placed.

Findings

The process generated a large amount of rich data. By processing this data into groups of similar statements from participants, key ideas could be detected and four main layers of wearability were identified, as shown in figure 4. The participants demonstrated through their models a clear understanding of the factors affecting device wearability.

Another area of for further research is whether the involvement of the potential wearer of the medical device in the design process would increase the potential for higher adherence. This is similar to "the IKEA effect" (Anderson, 2013) or the "I designed it myself" effect where people tend to value more highly those products in which they feel that have contributed to the process. (Franke & Piller, 2004).

Certainly there are a number of challenges for such design development, however provisional analysis pointed to the possibility of the design ideas generated by participants being realised for each individual to increase the wearability of the device. Moreover a range of devices embodying the solutions and creative ideas of all the participants would result in devices with a higher degree of wearability than those presently on offer.

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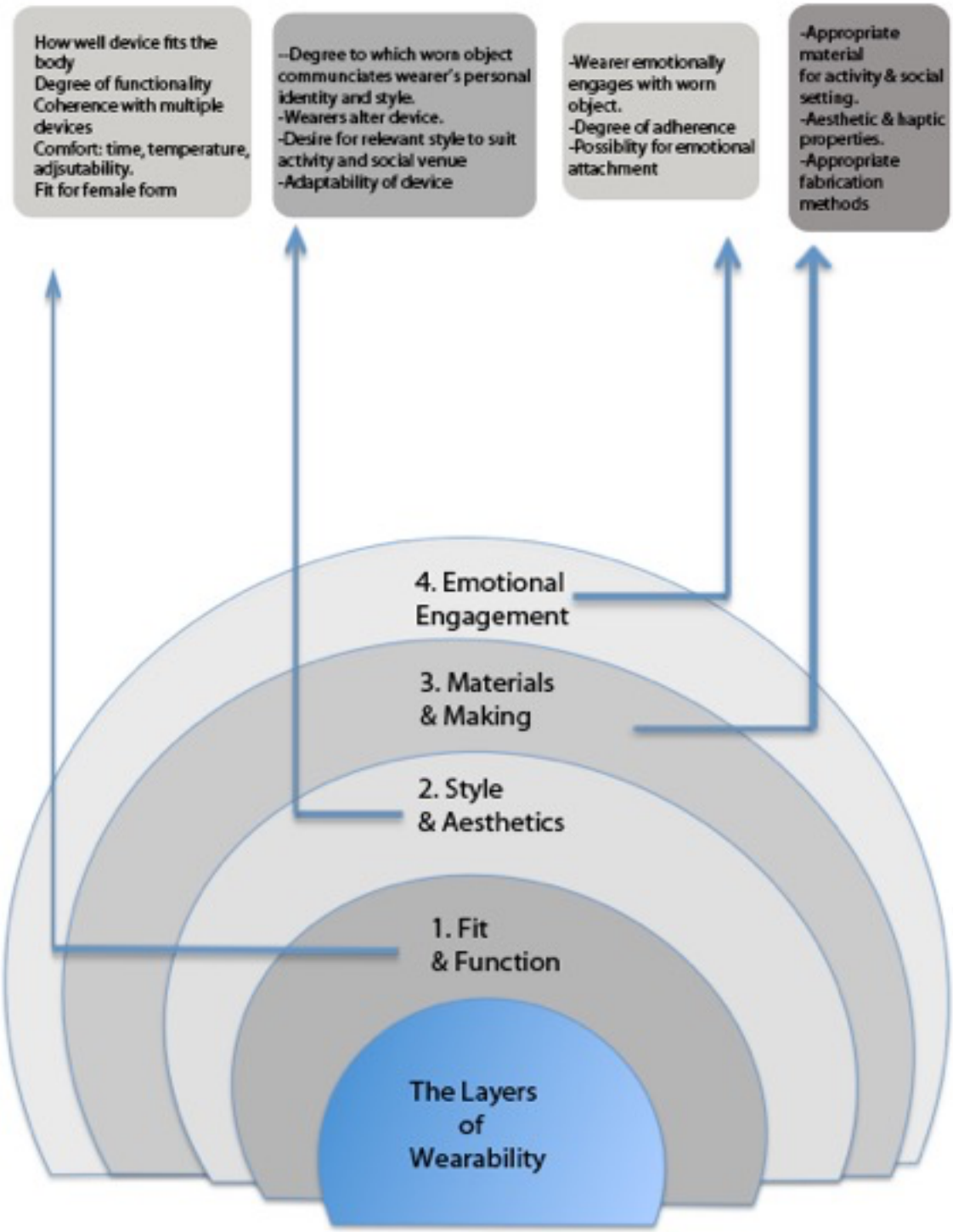

Figure 4: The Layers of Wearability

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Ways forward

The final implication informed by the research is to evaluate the proposal for therapeutic jewellery design. For this purpose a seminar with an exhibition of therapeutic jewellery is planned. The workshop participants will be invited, alongside contemporary jewellery designers and health professionals. It is hoped that the dialogue fostered in this seminar will continue via social media.

Another element of the seminar will be a demonstration of the researcher's proposal of a Digital Health project: a web based service for wearers of orthoses. Designs for the wrist will be displayed and one of the designs will be a scaffold device that can be personalised through the attachment of "panels" in a variety of patterns, materials and finishes. The scaffold would be 3D printed and the panels made in 3D printed materials (with the possibility of traditional fabrication of further panels). These designs would be 'open designs' and placed within a digital library for others to access and develop. A further option would be a bespoke service where medical utility would be integrated with an artefact that included the considerations of maker, hand therapist and wearer and offering materials chosen for both their character and performance. A service offering scanning of the body part would be also be available, to ensure the best fit possible for the wearer.

As Weightman and McDonagh comment: 'Using the potential of new technologies, active consumers can now become product creators, paralleling developments in graphics, music and digital media production' (Weightman and McDonagh, 2003). If people are involved in their healthcare decisions then a natural extension would be to encourage participation in the design of their own personalised healthwear; resulting in people feeling more emotionally committed to their devices.

Conclusion

By positioning the design of wearable medical devices within a contemporary jewellery practice, the issue of how to design health objects that are habitually worn by a person is extended beyond the focus on the medical body. The contemporary jewellery maker demonstrates a craft whose role is far more than simply adding aesthetics to a device, but who can enable the investigation of the themes of wearable objects that questions its motivations and relevancies, and challenge the themes of wearability, desirability and embodiment in order to promote adherence to the device.

The inclusion of people in the design process is shown to generate data that both inspires and informs, and this participatory design practice demonstrates that accessing the experiences of people and engaging them in the design process defines design processes in the design for wellbeing field. The implications of this research point towards an approach that incorporates notions of wellbeing, wearability and contemporary jewellery, alongside an understanding of embodiment in health, in order to design therapeutic jewellery or people-centric health objects.

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