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Imaginative Empathy and use of Somatic Perceptions in the Designing of a Therapeutic mask for Diabetic Retinopathy

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Abstract

This research is from a collaboration with PolyPhotonix, the manufacturer of the Noctura Sleep Mask. Over a two-year period, the collaboration explored the design, development and making of a Sleep Mask to house a non-invasive light-based therapy for the treatment of patients with diabetic retinopathy, vision impairment through complications of diabetes. The two-part therapy consists of a soft cushioned fabric mask housing a hard-structured Pod containing organic light-emitting diodes (OLEDs). The relationships, discussions and problem solving surrounding the felt experiences of the stakeholders were important in redesigning the mask to elicit greater compliance in wearing the mask whilst asleep. The existing mask design had interfered with patients' rest, inhibiting the duration of wear and reducing the efficacy of the treatment. My experience as a Contour Designer using stretch technical fabrications was instrumental in the development process where my collaboration flipped from expert to empathic participant.

Alfred Margulies (1989), in his publication The Empathic Imagination, talks of Keats' 'negative capability'. He explores Keats' interest in empathy and his pursuit in the '...goal of feeling himself into the reality of the other, as if to illuminate the object contemplated from within...' Margulies (1989: 5). Connecting with this pursuit, I aimed to elicit clear felt experiences about each person's somatic understanding in using the mask. It was important that I became part of the Noctura team. I volunteered my own felt experiences, which where valuable, in medical and interpersonal interactions to allow for meaningful dialogue that was not restricted to the normal formalities of a business meeting. The relationship-building and congruence in this collaboration aided my understanding of the different sensibilities to illness, to the body as subject and the body as object. The design processes and understanding were inclusive leading to the use of empathic imagination.

The resulting prototype received 85% positive feedback and compliance in wear by the patient users. Currently, the mask is being taken to Germany for specialised commercial manufacture.

Keywords: sensorial design; authenticity; empathography; multi-sensory experience; body perceptions

Introduction and Context

This research explores the sensorial knowledge of the designer and the stakeholders from Noctura in perfecting a therapeutic medical eye mask within a positive empathic framework. This two-year collaboration with the Noctura team (2015–2017) explored the design, development and prototyping a sleep mask to house a non-invasive light-based therapy for the treatment of patients with diabetic retinopathy (definition below). Noctura are a specialist company formed to develop this medical therapy for Diabetic Retinopathy and are part of Polyphotonix Medical. Collaboration is

multidimensional in its very nature. It brings different perspectives and expertise together to find common goals and solutions. The collaborators in this study were the Noctura Team; the Design collaborators – three-dimensional (3D) designers, Josh South and James Benham; Logo and Branding expert, Fiona Kitchman, the patient user voices; and me as the Contour Fashion specialist. The diverse stakeholder group delivered broad and rich feedback throughout the design process to corroborate the sensorial and design decisions from the iterative process described in this research. The patient user group had been established by Noctura to enhance the efficacy of medical therapy and wearer trails. To design a mask that users were content to wear it was important to gain truthful, authentic reactions, feelings and comments from the user group and stakeholders. It was, therefore, important to create an empathic space where all participants would freely volunteer information personal to themselves about their physical sensorial and emotional reactions to the wearing of the mask iterations. Figure 1 outlines the stakeholders in the collaboration.

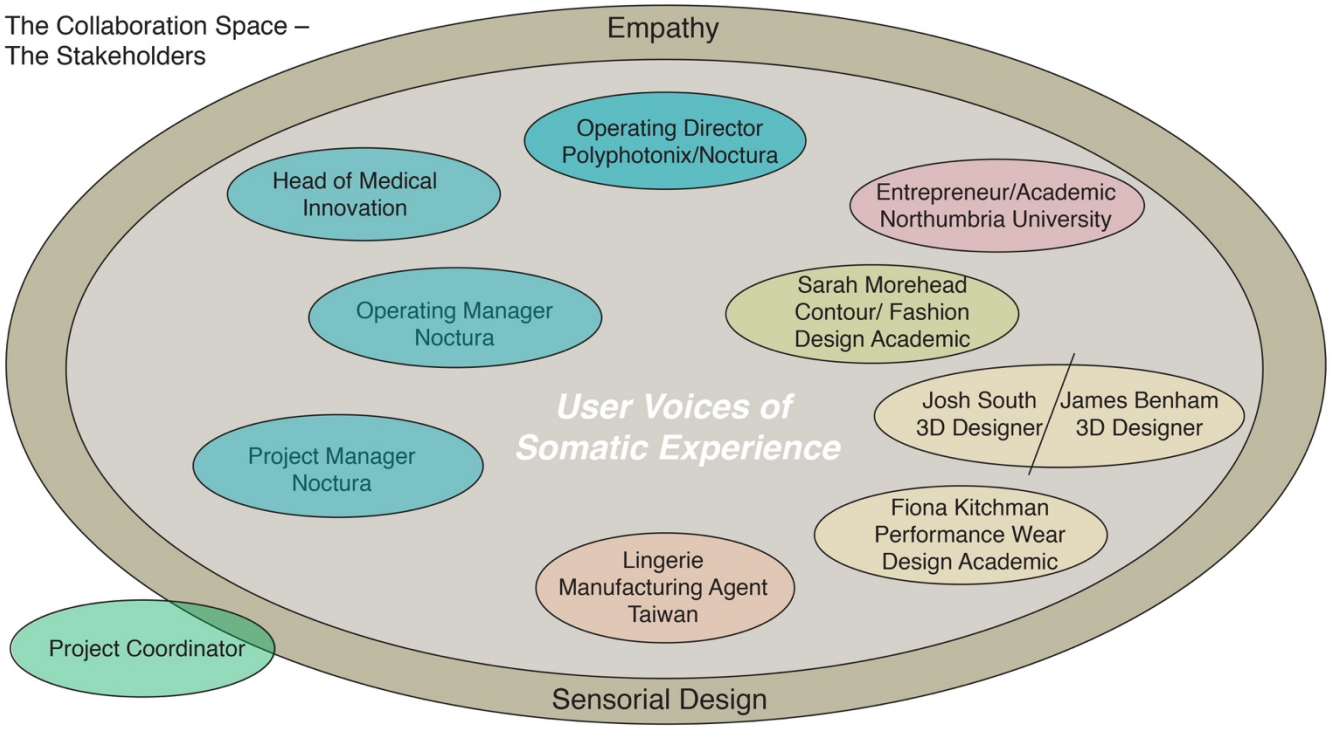

Figure 1: The Stakeholder Collaboration Space, 2015.

Empathic sensorial understanding of the body

Empathic Imagination, as Alfred Margulies (1989: Preface) confers, is where we can share introspective experience and internal landscapes of the other' and '...that there are sensory parameters of personal world views that we can gain rich insights into the unique essence of another'. In line with this, the Operating Director from Noctura, for the collaboration, allowed a non-hierarchical, emotional space where all participants and all contributions were valued. This shared space was where conversations were congruent, immediate and had authenticity around the patient experience, the experience of the staff using the iterations and the design collaborators' experiences in trialing and making the masks. It allowed time and reflective space for each of the collaborators to understand the nuances of the problem spaces, for innovation, progression and development to finesse the mask, and for participants to reflect on their own sensory world views imagining and feeling into the 'other' that would be wearing the mask on a daily basis.

The perspectives considered in sensory and empathic landscape for the design process

This practice uses bodily knowledge and thinking through the body as the design practitioner and works empathically with the stakeholders from Noctura to gain rich sensory ethnographic feedback on user experiences. Rako and Mazer cite Semrad (1980: 28) who states '…to truly communicate with people is to communicate with their feelings, usually in terms of their body feelings.' In The Empathic Imagination, Margulies (1989) indicates our striving towards a shared intersubjective experience, allowing us to consider the internal landscapes, sensory parameters and personal world views in our search for the unique essence of another.

In designing a housing, a mask for a medical therapy, it was the examination of my own personal experiences, landscapes and sensory perceptions that was to shape my imagination, my creative processes, in what Margulies (1989: Preface) calls '…groping towards the process of empathy'. Margulies goes on to state that the quest for empathy leads to the irreducible paradox of the self; that we find ourselves through the other in a reflective and interpersonal spiral. Part of that introspective self is the acknowledgement that we are shaped by our past and current experiences and that these experiences are embodied. Our soma, our bodies have imprinted a felt sense on our lives and memories. A felt sense in that we feel through our somatic self and a felt sense in that we perceive and create memories through feelings and our emotional selves. The designer acknowledges their past experiences in both capacities 'felt and felt' and the impact this has on the process of designing for another; to not just create a product but to acknowledge the 'felt and felt' experience of the mask that is to be worn by the other. The other whose experiences are shaped by 'normal' everyday being but also through illness, diabetic retinopathy.

Sian Beilock (2017), in How our Bodies shape our minds explores the notion that our somatic selves hold knowledge of our physical past; that this shapes our minds and memories and impacts our future physical and conceptual understanding of self and that the way we move affects our thoughts, decisions and our preferences. Her work looks at how mirror neurons work to help us understand another through physical empathy; that we physically emulate the 'other' in our minds to get a greater comprehension of what the other person is experiencing (Beilock 2017). In this way a designer reflecting on what they feel through observation of another can aid their understanding of how a garment is received and worn and what physical nuances can be observed and reflected in one's own sense of self.

In the Wounded Story Teller, Arthur Frank (2013) writes about how we frame our stories and our narratives through our bodies; that when disease disrupts our old stories, we need to tell new ones. He goes on to quote Rita Charon who writes of the physicians' need '…to allow our own injuries to increase the potency of our care of patients, to allow our personal experiences to strengthen the empathetic bond with others who suffer' (Frank 2013: xi). The designer can use this understanding of personal narratives surrounding health, to become authentic and congruent in conversations and shape the designerly processes.

Richard Shusterman (2013) in his philosophical theory of somaesthetics looks to methodologies that are integrative and better understand our somatic experience in the world. He tells us our body is our indispensable tool for acting in the world, indicating that if we pay greater attention to our own felt somatic experiences and responses to the world, we can in turn create better products and more rewarding and pleasurable experiences for our users. To Shusterman (2012;), somaesthetics is interactive, as the body is interactive and that we feel our environment with every interaction. In this study, the environment is the body's interaction with a therapeutic mask while lying in bed and

sleeping. Shusterman (2015) asserts that each person has '…different experiential tendencies and motor schemata' and that Somaesthetic Design involves respect for the experience and subjectivity of the user. In understanding our own bodily feelings, we can imagine how another might feel in their body. Using an empathic imaginative response to designing for another and through our library of personal sensory experience of the aesthetics of design, cut, colour and materials that house the body, we can make considered personal design solutions. Through our observation action and construction, we can engage with others on a parallel level of intensity, that is we can physically empathise with another's perceptual experience of self.

In their paper Empathy on the edge, Katja Battarbee et al. (2019: p3) state that '…when we are empathetic, we enhance our ability to receive and process information.' This causes changes in our subconscious behaviour and our cognitive style, increasing our 'field-dependent thinking' with which we can pick up contextual cues from our environment. This is essential to understanding how things relate literally and figuratively (Battarbee et al. 2019). Battarbee et al. (2019: p3) go on to say designers must be aware of the mode of thinking they are operating in and '…to think and feel, rigorously and deeply.' This reflects back to Margulies (1989: Preface) 'The journey towards shared intersubjective experience…' and at the centre of that experience we have to be aware and have empathy for the self so we can have empathy for another.

Sarah Pink (2009: p1) argues that doing sensory ethnography '…takes as its starting point the multisensoriality of experience, perception, knowing and practice'. Multisensoriality is integral to our own and our participants' way of being and is therefore a vital part of the practice of undertaking sensory ethnography. She invites scholars from diverse disciplines to share the processes in which sensory knowledge has become academic knowledge (Pink 2009). Pink (2009) proposes to understand sensory ethnography through a theory of place and place making and to outline the significance of memory and imagination in the ethnographic process. In this work I wish to engage the respondents in the significance of imagining and engaging with orthotic and healthcare products that influence the inter-relational sensorial modes of being. Studies in the senses are coming increasingly to the fore. Pink (2009) insists that ethnography is a reflective and experiential process through which understanding, knowing and academic knowledge are produced and that researchers must be open to multiple ways of knowing. Ethnographers should aim to offer versions of their '…experiences of reality that are as loyal as possible to the context, negotiations and intersubjectivities through which the knowledge was produced.' (Pink:2009:p8)This study aims to bring together a sensory ethnographic study that relies on empathy and empathic imagination with research through design. The designer is to act as a participant and an observer in the study in order to gain a rich understanding of the other who wears medical therapies that are wrapped around the body.

What is Diabetic Retinopathy?

Almost 2,000,000 million people in the United Kingdom (UK) live with sight loss of whom around 360,000 are registered as blind or partially sighted (NHS 2018). Being told you have a visual impairment that possibly cannot be treated can be difficult to come to terms with. Some people go through a process similar to bereavement, where they experience a range of emotions including denial, anger and depression before eventually coming to accept their condition and work with health professionals to manage their treatment.

Diabetic retinopathy is damage to the blood vessels in the retina, the light-sensitive tissue at the back of the eye. It is caused by high blood glucose levels and circulation problems and can cause loss of vison. Diabetes can starve the retina of oxygen, this is called hypoxia. To protect itself, the eye

produces a protein called vascular endothelial growth factor (VEGF) causing new blood vessels to grow in an effort to deliver more oxygen to the retina. These blood vessels are often weak and leak fluid into the eye exacerbating the problem of oxygen supply, causing the retina to become inflamed and creating a vicious cycle of disease progression. When someone is asleep, the eyes need more oxygen.

Diabetic retinopathy can cause loss of night vision, periphery vision and blurred vision. The main treatments for more advanced diabetic retinopathy are laser treatment, injections of medication into the eyes or an operation to remove blood or scar tissue. One of the prevalent treatments for diabetic retinopathy is a monthly intravitreal injection of anti-VEGF. Injecting the eye with anti-VEGF costs the National Health Service (NHS) (2018) approximately £6500 a year per eye, per patient. The injections need to be repeated every month on each affected eye. They can cause serious complications, such as endophthalmitis or retinal detachment, leading to patients requiring serial treatment over many years.

Richard Kirk, artist and medical pioneer, founded the company Noctura. He researched and developed a medical therapy to change eye care treatment for diabetics and the elderly. He discovered that the printed organic light emitting diodes (OLEDS) that he was making at Polyphotonix had certain properties that would lend themselves to aiding those with diminishing vision from diabetic retinopathy. In 2013 Polyphotonix worked with Industrial Designers at the Centre for Design Research (CfDR) at Northumbria University, UK, to develop a Pod to house the OLED medical therapy.

OLEDs illuminating the retina during sleep combat the progression of diabetic retinopathy. The precisely tuned wave lengths of light ease the oxygen demand in the eye. These lights are specifically designed to stimulate parts of the eye and do not disturb sleep. When the oxygen demand of the eye is reduced to daylight levels, this breaks the cycle of damage that leads to diabetic retinopathy. The wave lengths emitted from the OLEDs are '...configured in such a way that when light is put into the eye, the cone, which is used in the daytime, doesn't see it, so it doesn't inhibit sleep' (Noctura: 2015)

Figure 2 and 3 visualize the diabetic eye with high oxygen demand and the diabetic eye where the oxygen demand during sleep is reduced when using Noctura Therapeutic Medical Eye Mask.

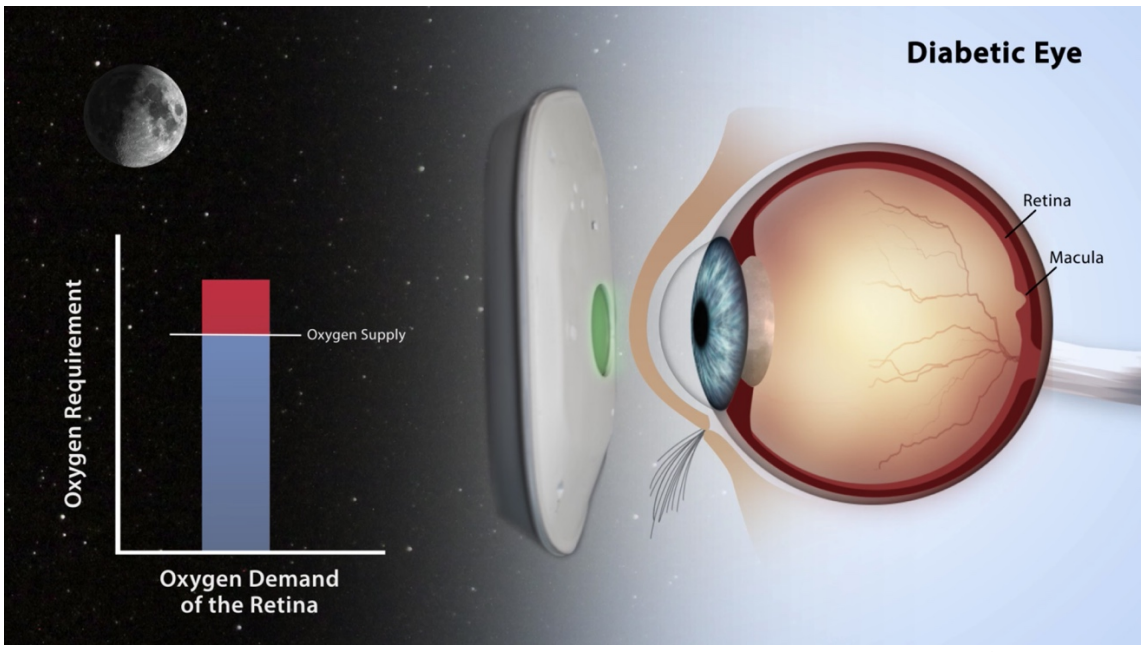

Figure 2: Diabetic eye showing high oxygen demand (Noctura 2015).

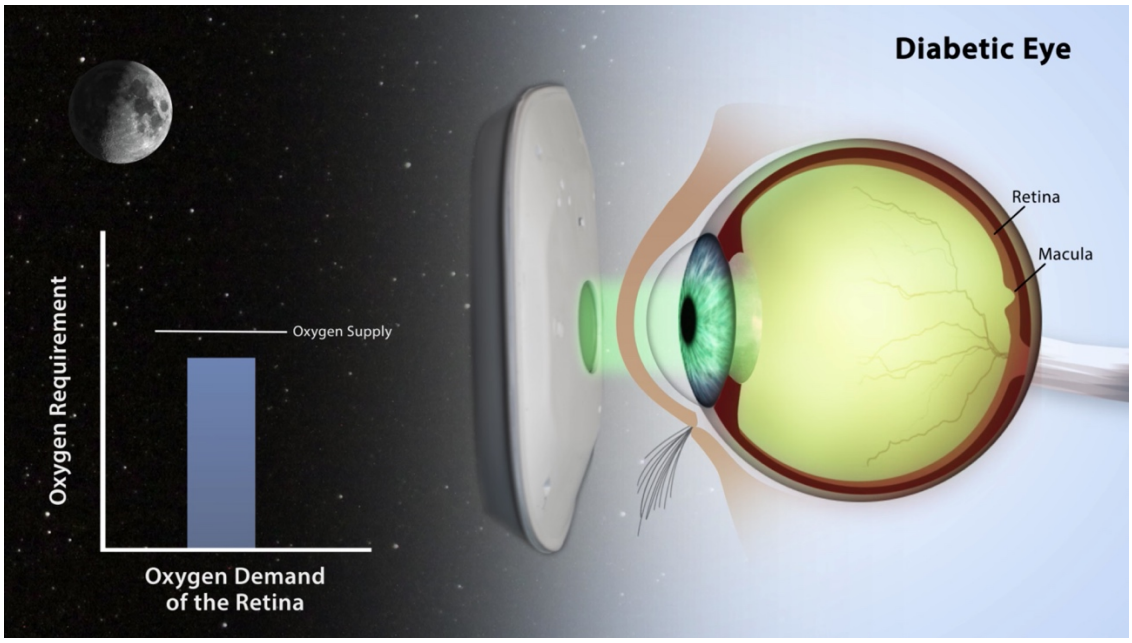

Figure 3: Diabetic eye oxygen demand during sleep using Noctura Therapeutic Medical Eye Mask (Noctura 2015).

The Therapeutic Medical Mask

The patented Noctura 400 Sleep Mask is supplied in two parts. A soft-cushioned fabric mask and a 'pod' containing OLEDs and a battery power source. The original mask was a die cut pressed foam construction adhered to a strap base. The side worn next to the face was a raised foam structure which caused pressure on the eye and did not allow for any movement of the eye ball, eye lid or lashes with any comfort.

Over time, different individuals from industrial design backgrounds had tried to redesign the mask housing to address the issue of user 'compliance'. Compliance is often used in medical lexicon to denote that the patient is using an orthotic or medical intervention as instructed. Compliance as a description could refer to submission, passiveness or acquiescence, none of these descriptions give a sense of empathy to the persons using the therapy. Users abandoned the therapy despite knowing the benefits to their sight health, reporting discomfort in wearing the mask inhibiting quality sleep. Lack of sleep creates a new health issue, as sleep is important to the body for rest, repair and recovery. Creating a mask that addressed this issue would aid compliance with the therapy and not intrude on other areas of patient health. The new design had to utilise the existing hardware Pod.

The iterative process of co-production of knowledge

Figure 4 shows the cyclical process used in developing the iterative designs. The process has multiple elements that demonstrate empathy and understanding of somatic selves in the process. The aim was to observe the physicality of trying on the mask, taking note of the ways of being and listening to the nuance of conversations around each iteration by the stakeholders. The author, as a both a participant and designer/observer then discussed the iterations to forge new possibilities. New manufacturing processes were discussed at each stage to foresee commercial application. From these discussions, refined designs were made for patients to wear and test. Each stage and process were revisited at regular intervals over a two-year period to bring greater resolution to positive felt experiences from the user group until a final resolved mask had been developed.

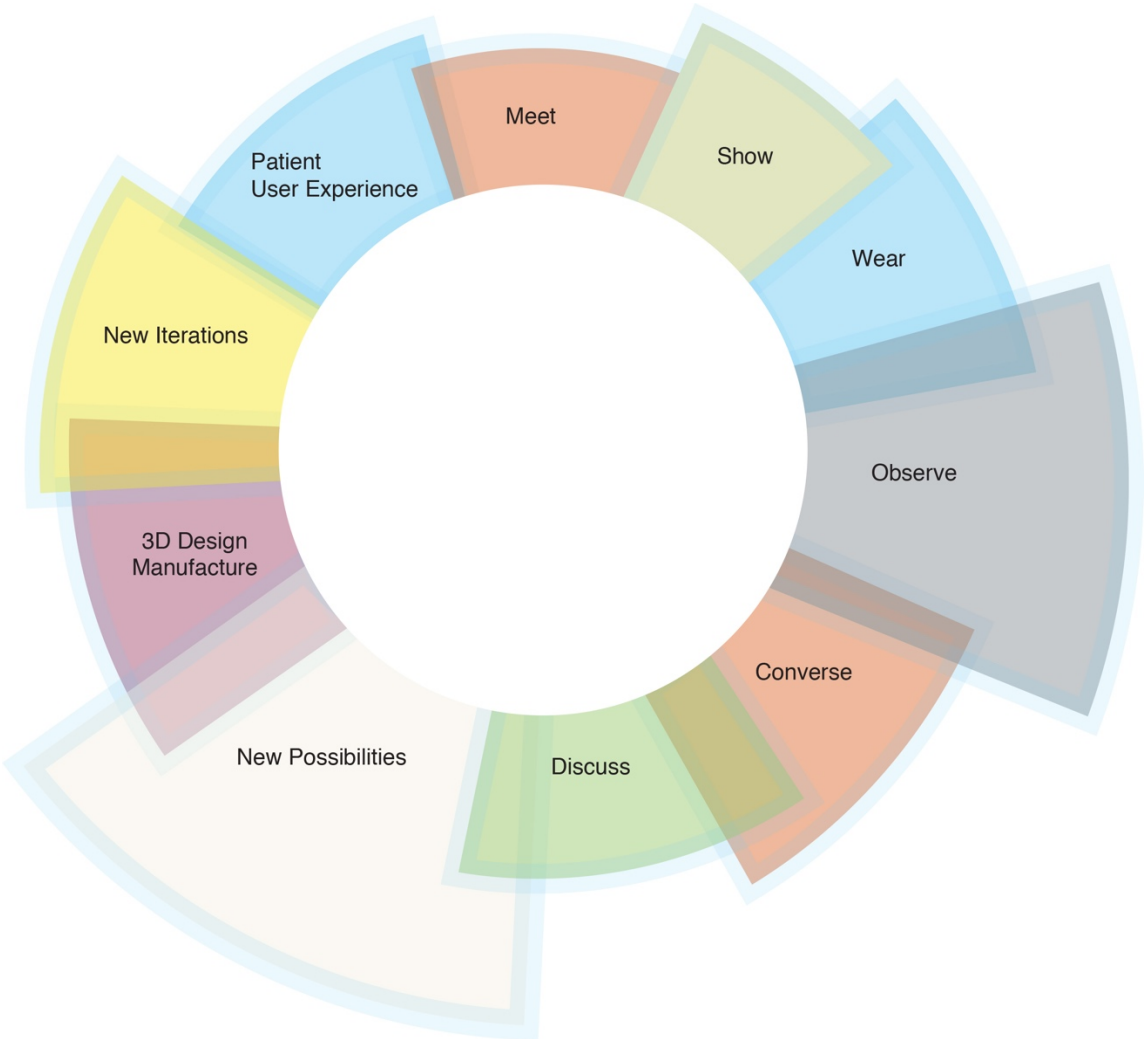

Figure 4: Empathic sensorial process of eye mask development.

Background of initial product development

Industrial designers at CfDR had developed the Pod in 2011 to house the OLED medical therapy. The same designers initiated development of the mask structure to house the Pod and various individuals had intervened attempting to understand how to improve the fit and comfort of the mask.

Industrial Designers typically work with hard substrates and have knowledge of resistant materials to fine tolerances. Whereas, fashion designers typically work with soft materials and understand the complex curves and differences in the body topologies to develop intimate apparel. For the project described in this paper, the Author has previous industrial experience as a fashion designer with specialisms in contour design and the development of soft pliable structures that wrap and are held in position around the human frame such as lingerie, swimwear and corsetry. The Author has worked with new construction methods and material structures to aid the design for soft products for Peacocks Healthcare, Berghaus and alternative approaches for swimwear construction for Speedo. The felt experiences of designers can build a library of personal sensorial knowledge that can aid the creation of new garments for intimate apparel.

The cloth used for the mask designed in this study was from EuroJersey and was selected for its stability, stretch, matt flat surface and innovative technical range of stretch warp knit using micro fibre and Lycra materials. The Sensitive series of fabrics have a smooth and homogeneous surface that give a soft sensation around the face. The fabrics are breathable making them suitable to develop contour garments that fit seamlessly as a second skin that flex with the body. EuroJersey construction

has an Elastane fibre (Lycra Brand) that '...is protected by the microfibre which is wrapped around it...' and the 'Lycra and polyamide together form a single thread' (EuroJersey 2018: no pagination). This is innovative, as when the fabric stretches the knit opens and when it relaxes the elastic memory of the cloth prevents a curling effect. Traditional jersey substrates can be problematic by not allowing the material to stay flat in the lamination processes.

New laser cutting and bonding construction methods have the potential to enhance the wearing experience of a contour garment like the mask. The stretch lamination sheet stretches evenly with the EuroJersey Sensitive fabric it is bonded to, thereby allowing for incremental, or micro stretch; in contrast, the rubber, silicone or encased elastics stitched to the main fabric may form new irregular stretch patterns detrimental to appearance and comfort. The microstretch lamination is smooth and perceptually invisible unlike the grip of traditional elastic applications.

In designing the mask, it was considered that any stitching that could be felt on the face would be an irritant that would affect user somatic perceptual experience, especially when a user rests their face on a pillow to sleep. The lamination techniques in developing the mask were key to achieving greater sensorial comfort around the face where all the senses converge, heightening our perceptive experience.

The design and making

Noctura wanted a single size mask, suitable for the widest demographic possible. This was a major constraint to designing the mask and it was complicated by a need to keep the light-emitting hardware firmly in place to provide the correct therapeutic treatment.

The first sensory design problem for the project to resolve was lifting the mask out of the eye socket area so that the user could not feel the Pod on their eye and provide a comfortable fit that did not put pressure on easily irritated parts of the face, such as the nose bridge and eye sockets. This was in part resolved by bonding two layers. A heavy weight EuroJersey as the main base strap that would be closest to the face; and a single more elastic Sensitive EuroJersey layer bonded to the outer mask to house the Pod. The more elastic stretch of the brown, lighter weight softer layer (100mm elongates to 147mm) that housed the pod was laminated in an outline to the less elastic firmer substrate (100mm elongates to 130mm) shown in figure 5. This allowed the more resilient firmer substrate to stay put and the more elastic substrate to deform where it was not held by the laminate and thrust the Pod away from the face. Figure 6 illustrates the laminate pattern.

Figure 5: First prototype demonstrating fabric qualities and principles of how different stretches in fabrics allow for enclosing objects such as the Pod.

Figure 6: Freudenberg laminate pattern for Pod pocket.

The homogeneous surface of the EuroJersey fabric has added advantages as it provides a particularly good flat surface that allows for bonding of surfaces to create structures. Importantly it does not curl when laser cutting fine single layers and keeps stable shapes after cutting. This flat surface also gives good adhesion not commonly found in many stretch fabrics and was suitable for lamination and bonding.

The first bonding substrate used was Bemis sheet glue that was stable and effective. This particular sheet laminate did not allow the EuroJersey fabrics to maintain their breathable qualities. Consequently, the laminate structure was changed from a flat sheet to a pin dot structure from Fruedenberg which maintained the breathability and stretch qualities of the surfaces important for user comfort and also allowed the sensor capacitors in the Pod to continue to work.

As part of the brief, the designer explored other fabrics with the potential to reduce production costs for the mask. EuroJersey was substituted with a classic high sheen Lycra knit similar to traditional swimwear fabrics. User feedback on an array of samples was not favourable. They did not like the sheen, texture and felt experience of the material, describing it as hot and slippery in contrast to the somatic and aesthetic experience of the masks made in the EuroJersey.

The nose became significant as a registration point in the middle of the mask that would enable an optimum fit where the eye holes aligned with the eyes to receive the light therapy. The ‘Arch’ shape that rests on the nose area was changed repeatedly by millimeters to gain the best overall comfort. This process altered the fit to the nose and in turn moved the position of the eye holes. The width of the arch was changed and moved to the widest point possible within the constraints of the housing for the Pod. This allowed greater comfort for those users with wider nose structures. Figure 7 illustrates the alignment of the nose.

Figure 7: Aligning the nose registration point to ensure the light therapy is delivered.

The jagged principle

Noctura aimed to increase the compliance of using the mask to 95%. I discussed the 'jagged principle' with the team; Tod Rose (2017) talks about this in his book The End of Average. This principle holds that in affect there is no such thing as average in human size, characteristics of intelligence, character, talent and creativity. Rose (2017) highlights Lt Gilbert Daniels study, in the late 1940's the United States (US) Air Force noticed that they were losing pilots and planes at an increasing rate. Daniels (in Rose 2017) began to measure pilots' limbs with a tape measure and then discovered an 'average pilot size' so that they could redesign the cockpits with this new information. Not one of their pilots fitted these new cockpit dimensions. The jagged principle demonstrates that 'average' does not make a good starting point in the creation of product.

New stakeholder from Noctura

The jagged principle was demonstrated and became evident to the collaborators when a new user joined the team to contribute to the development of the mask. Until now all of the processes and iterations had worked well with the team and the users.

The designer observed the new contributor had a flatter face than others in the group who predominantly had deep eye sockets and a definite nose bridge. This caused experiences of pressure and bruising feeling on the eye lids and inhibited opening the eye whilst wearing the mask, similar to those problems experienced by other users with the initial design. Group participation in low-fi experiments with foam and tape to lift the mask again from the cheek bones allowed for the next intermediate iteration that still explored fit rather than aesthetics as shown in figure 8. The group consistently showing empathic somatic understanding for the other.

Figure 8: Foam lifts mocked up and discussed in empathic sensorial meetings.

Figure 9 shows how the foam lifts the brow and cheek bones to allow the Pod in the mask to be lifted away from the face again. It also allowed users to open their eyes comfortably but still benefit from the therapy.

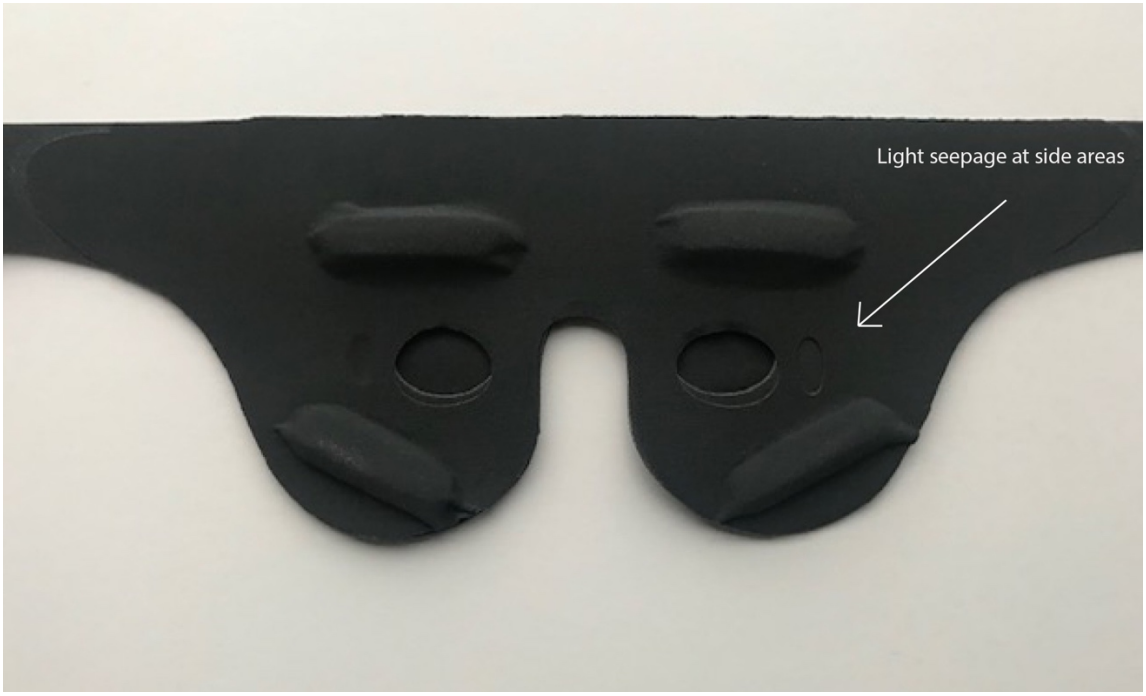

Figure 9: Light seepage at sides disturb partners sleep.

Figure 10 illustrates the simple sample using foam board as a method to make a low-fi female mould with acrylic laser cut male forms inserted on a fuse bed that made the indentations needed to house the foam sections. This iteration had success for our newest member. However, the foam lifts let the light from the pod seep through the side gaps and disturbed user partner's sleep.

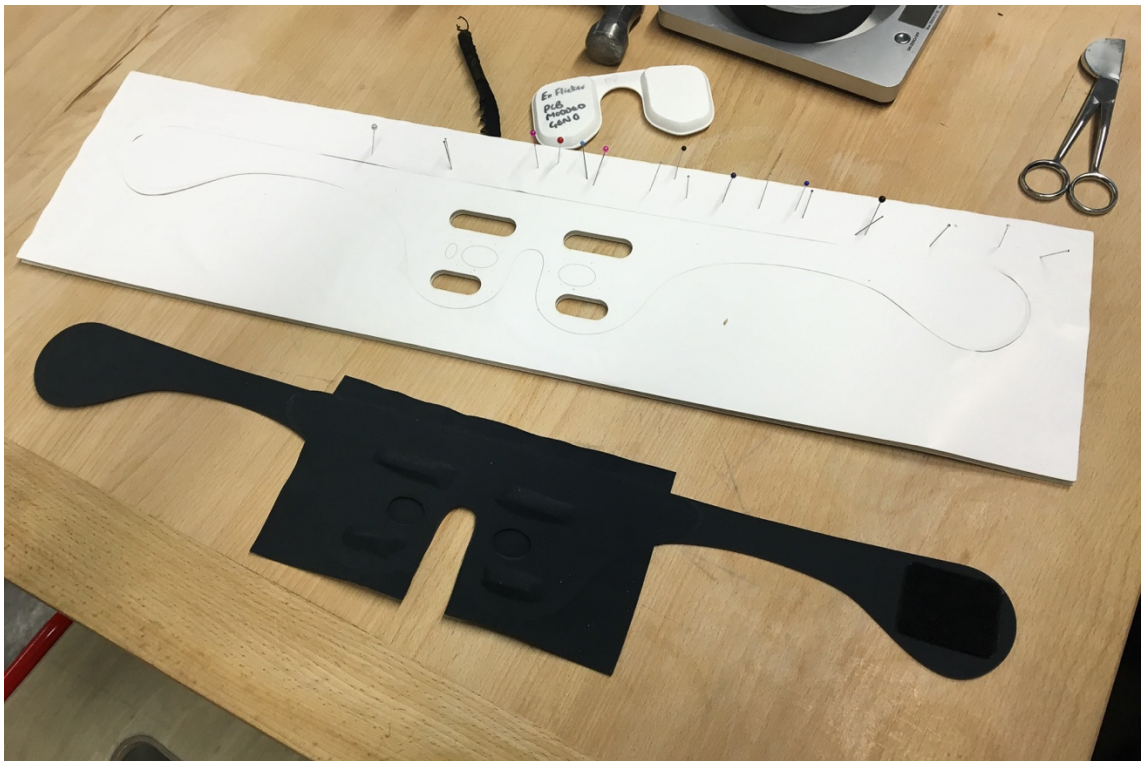

Figure 10: Foam lifts made with low-fi mould.

The low-fi methods of sampling proved successful, as a result of this, a more sophisticated 'horseshoe' mould was developed. Figures 11 and 12 are the moulds developed from SolidWorks CAD software by 3D designer James Benham for the lingerie manufacturer in Taiwan to produce wearer trials. The die cutting template for the factory was to replace the laser cutting methods used in prototyping. This became the best fit and was adopted for wearer trials for the users. The mask had a good fit and was a comfortable shape around the face eliciting, not impeding, a good night's sleep for the user. Figure 13 demonstrates the multiple iterations in developing the best fit for patient use.

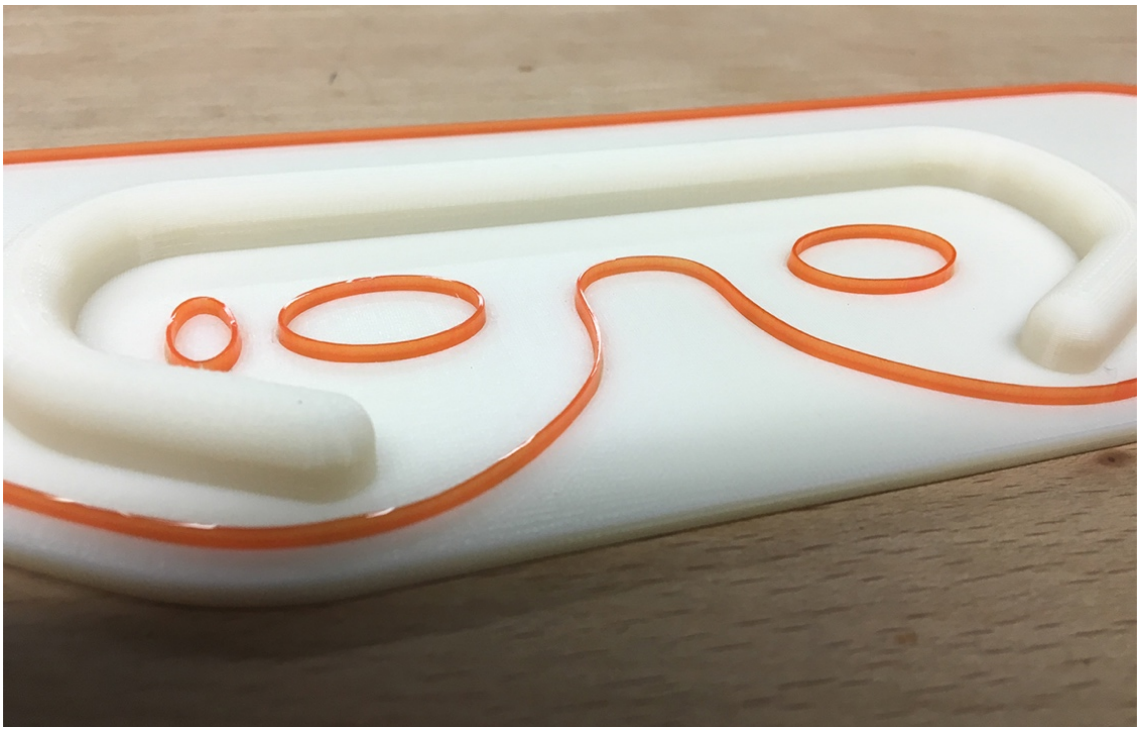

Figure 11: Male form for 'Horseshoe' mould.

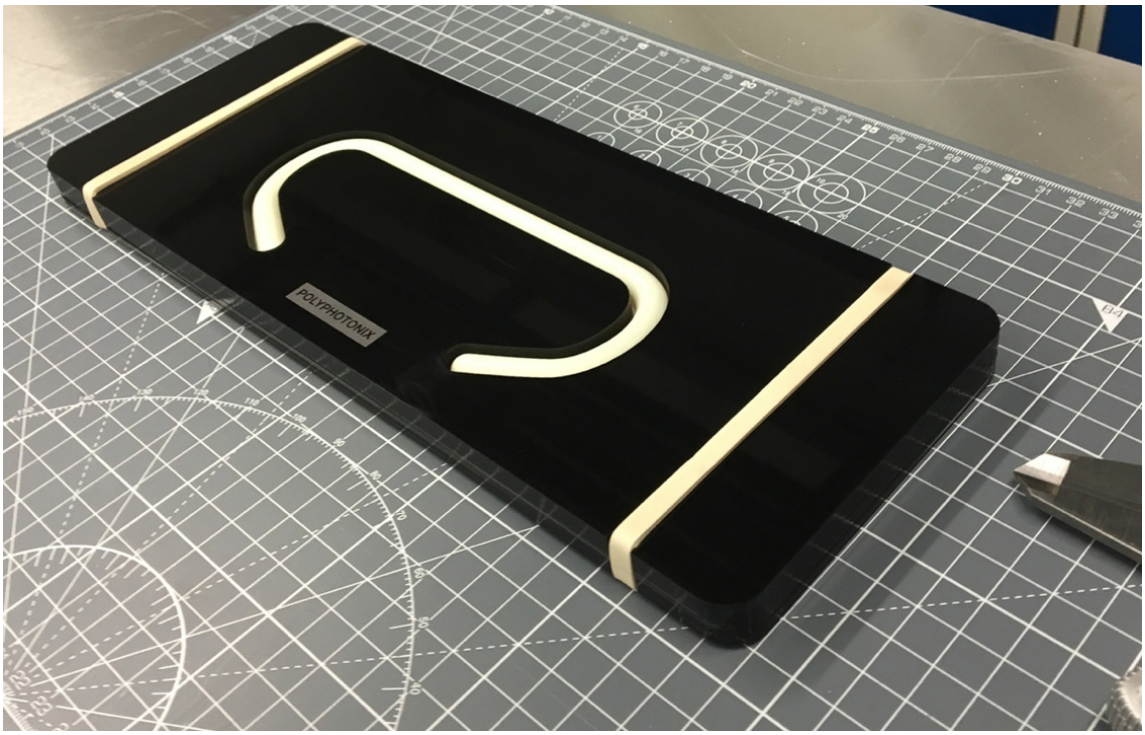

Figure 12: Female for 'Horseshoe' mould.

Figure 13: Design iterations evidencing the slow reflective empathic process of listening to the body.

The next stage was to develop the aesthetics that contributed to positive feelings regarding the therapeutic mask. With slick digital technologies and sophisticated garments common today, the team wished to show empathy and respect to the user by giving the mask a sophisticated aesthetic. It should be a modern mask evoking positivity, not a mask belonging to a 1960s medical appliance for a therapy that needed to be endured. A mask to mark a positive journey to look after the self, in much the same way as Arthur Frank (1997) talks about how we frame our stories after disease disrupts our old stories and we begin to tell new narratives about ourselves. The 3D designers from Northumbria University, Designers in Residence, were valuable professionals in this process. They sat in and took part in the

wearing of the iterations. Through metaphor and analogy, they worked with the designer to construct the necessary CAD files to make the patterns and also the subsequent moulds for the mask.

During the two-year period there were numerous design iterations evidencing the slow reflective empathic process of listening to the body. Figure 14 demonstrates the fit of the mask before addressing the Pod pocket opening. Figure 15 shows the need to think more widely about user experiences in creating a large tab area on the back of the mask. This was to enable some users with Diabetes who might have problems with damaged nerve endings in their fingers to feel the strong presence of strap ends when fastening. Figure 16 illustrates the final mask 3D render showing the Bemis silicone areas that inhibit slippage of the mask on long hair or no hair. Figure 17 draws upon Fiona Kitchman's expertise in branding applications with Franz Barta to achieve the best aesthetic to embed a logo into the fabric, the scale, position and colouration of the logo against the mask material. The logo was placed on the fastening tabs at the back of the head. This allowed the user to be aware of the brand in a discreet sense and avoided the dominant branding becoming obtrusive for both user and partner in the personal intimate space of the bedroom.

Figure 14: Intermediate development to start addressing pod pocket opening.

Figure 15: Rear of mask.

Figure 16: Final mask, 3D render showing Bemis silicone areas that inhibit slip of mask on long hair and those with no hair.

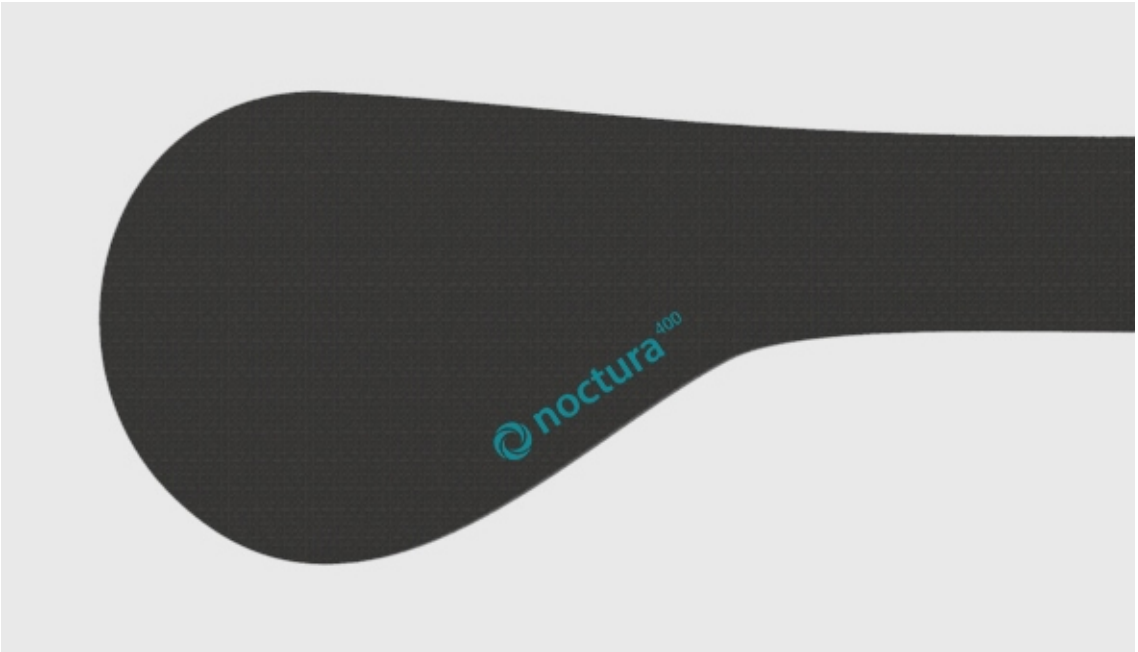

Figure 17: Logo development and placement.

User experiences

Figure 18 illustrates some of the user comments and experiences from using the new mask iterations and their aspirations during the two-year process to improve the comfort, aesthetics and self-understanding of their active participation in improving their own healthcare through this design process.

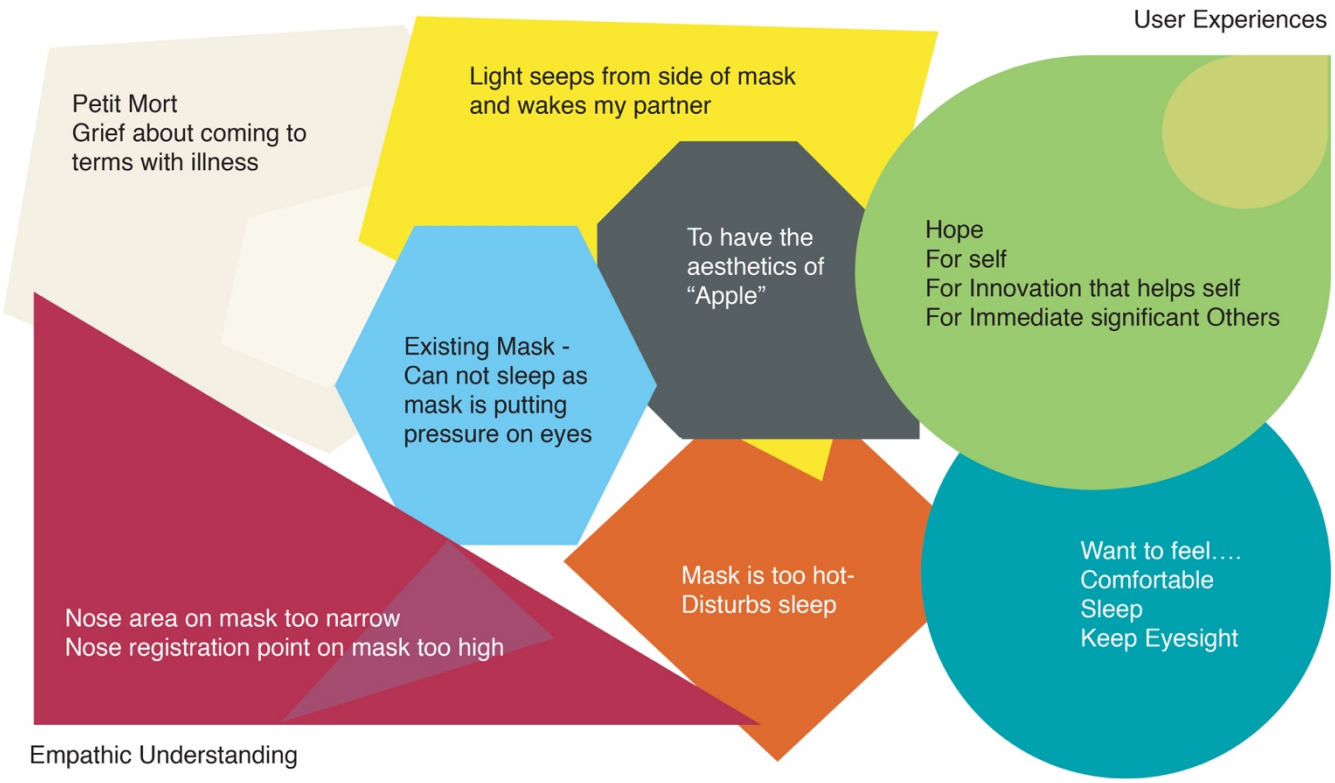

Figure 18: Comments and observations exploring empathic somatic experiences of users of the therapeutic eye mask.

One user contacted the designer directly, showing a willingness to encourage the designer to resolve the comfort problems in order for the user to experience greater comfort in using the therapy. Sharing was an act of personal trust and courage to enable the development of deeper connections with each other. The shared reflections were used to inform design iterations and developments.

The object of this research was to make the mask garment as near to invisible as possible, to overt perceptual experience and enable 'normal to self' aspects of felt experiences come to the fore. The mask was to be as near possible an extension to the body's perception of self rather than an alien force. The final mask is made of 18 different components using eight fabrications including lamination, die cut, laser cut and moulding processes. The users in the wearer trials had increased positivity towards wearing the new mask. Their sleep was less affected and this increased the efficacy of the therapy. Figure 19 shows the final mask with Pod inserted. As a result of this research, Noctura are developing the mask for commercial manufacture in Germany.

Figure 19: Final mask –
To have empathy for another, one has to reflect on one's own empathy for self.

Conclusion

Empathic and sensorial aspects in the design process impacted decision making when evaluating the major or incremental iterations in the mask development. Carl Rogers (1951: Location 8580 Kindle) notes in number 18 of his 19 propositions that:

> *When the individual perceives and accepts into one consistent and integrated system all her sensory and visceral experiences, then she is necessarily more understanding of others and is more accepting of others as separate individuals.*

When empathy is visceral, felt and sensorial then we can relate to others experiences more clearly, we can use empathic imagination about another experience and about making that experience better.

The philosophy of sensorial engagement with the world is gaining greater understanding from multiple perspectives; from analysing personal experiences and the study in neuroscience (Blakesee and Blakesee 2008) that evidences or corroborates what is happening in those personal experiences. Sensorial scholarship has always been evident in fashion design to a greater or lesser extent but it has never been described, partly because the sense of touch and proprioception are so difficult to articulate. Sensorial scholarship whether that be in empathography, ethnography, anthropology or design can impact on research knowledge and how design decisions are discussed and developed. It is not co-creation in making the object but co-creation in formulating a set of principles and knowledge to aid the design process. Each individual has their own professional background and those sensorialities build a library of tacit, embodied knowledge that through active listening, observation and empathy can be applied to the final artefact.

Alfred Margulies (1989) highlights that to have an empathic imagination for another, one has to reflect on one's own empathy for self. Hook, Stahl, Jonsson, Mercurio. Karlsson. Johnson (2015) echoes this when they say '…we learned that as you become more aware and empathic with yourself, you also become more empathic with others'. As a design practitioner this way of working with materials and processes has its own congruence and authenticity. The reflective nature of the Noctura team is

testament to their tenacity to progress an important treatment for diabetic retinopathy. This is a model of collecting qualitative observational studies, reflective dialogue of personal expression of somatic self through empathy and the senses. This allows a rich understanding of how different individuals' bodies and felt experiences affect their sense of self in different contexts of both wellness and dis-ease, a philosophy echoed by McDonough and Formsa (2008: no pagination) in their research 'Designing for Everyone, one Person at a Time'. This mode of massification of a single product could also more broadly contribute to mainstream fashion products for a more sustainable future where bodies and our senses together with our emotional selves are more empathically considered and designed for. Finally, Margulies (1989) indicates that empathy is a personal and interpersonal quest that is never static. That in exploring the interpersonal, the other, we are at the same time exploring our sense of self in a reflective spiral. That is to have empathy for the other we must reflect on one's own empathy for self. The design process employing empathic imagination brings the user experience more into focus and enables the best outcomes from the materials and processes available at any given time.

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