Cinderella, you can go to the ball: inclusive footwear design at the intersection of medicine and fashion.

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Abstract
Women living with rheumatoid arthritis are restricted in their choice of footwear by the deformities in their feet. Research has shown that this in turn limits the choice of clothes they can wear, where they can go and what they can do. Despite pioneering work undertaken in the design of comfort footwear, there is an ongoing disconnection between the approaches of an aesthetically trained shoe designer, and a medically trained foot clinician. This can be seen in the context of specialist therapeutic footwear, and on the high street where the socially and personally expressive aesthetics of fashion are often in conflict with the functional understandings held within medicine.

A more sensate and dynamic view of clothing is explored, to suggest how this opens up the study of the physical, bio-medical body alongside the clothed, socio-cultural body. The authors propose that the personal, social and functional complexity of footwear brings a unique opportunity for research at the intersection of fashion design and medicine, where mutually limiting attitudes and practices can be identified. We outline the potential for re-orientation in the ‘patient’/health practitioner and ‘user’/design practitioner relationships and indicate how social innovation may be fostered through inclusive and participatory design methods.

Keywords
Aesthetics, adornment, body, clothing, dress, embodiment, health, fashion, feet, footwear, function, identity, inclusive design, lived experience, personal, rheumatoid arthritis, shoes, senses, social, wearables, well-being.

Introduction
The familiar ‘Cinderella’ folk tale tells of the unjust oppression of a young woman and how this is eventually replaced with triumphant reward. In the story, a fairy godmother creates beautiful clothing and adornment for Cinderella, including a pair of bespoke glass slippers. Dressed appropriately, she is then able to attend the ball. A strong link is made between Cinderella and her footwear, as her slippers will fit no other. The footwear symbolises her identity and brings about her rightful social inclusion. This deceptively simple folk story draws on our tacit social awareness of how clothing and footwear contribute to the formation of a woman’s identity: “the sense of self, of personhood, of what kind of person one is” [1], and how this then impacts on her social life.

For some women, footwear choices are severely restricted by foot deformities, such as those caused by rheumatoid arthritis (RA). This limited choice of footwear also impacts on what clothing styles they can choose to wear. As a result these women feel that they cannot engage in some social activities, particularly more formal, celebratory or
ceremonial occasions, and this contributes to their sense of social isolation [2] [3] [4]. Despite pioneering work undertaken in the design and manufacture of ‘comfort’ footwear, there is an ongoing disconnection between the approaches of an aesthetically trained shoe designer, and a medically trained foot clinician. This is a particular problem in the context of ‘therapeutic’ footwear (Figure 1) provided through health services, where the socially and personally expressive aesthetics of fashion are often in conflict with the functional understandings and professional paradigms held within medicine [2] [4].

![Figure 1: example of NHS Therapeutic footwear (left), and high street fashion footwear (right)](image)

Underlying this dichotomy are the complex issues that exaggerate the social stigma experienced by women with RA. Recent research undertaken in the contexts of healthcare [2] [4] and clothing design [5] has shown that shoes are perceived not only as functional items but also as items imbued with potent socially defined meanings with the potential to compromise codes of dress, if worn inappropriately. The authors intend to draw on this research to indicate the unique potential of footwear to liberate mutual understandings at the intersection of medicine and fashion design. In order to more fully understand the ongoing disconnection between these disciplines, the next section will consider differing viewpoints of human embodiment: the physical body that is treated by medicine, and the social, emotionally expressive body that is dressed by fashion.

**Two bodies of knowledge**

From a standpoint that spans sociology and fashion theory, Entwistle [6] has consistently drawn attention to the ongoing lack of concrete analysis of the relationship between dress and the body. Historical and contemporary studies of fashion have tended to focus more on clothes themselves and their symbolic and socially constructed meanings, than on the lived experiences of the individuals wearing them. In contrast, theorists of embodiment and medical practitioners engaging with the physical body have almost always ignored the presence of clothing. As a consequence, there is ongoing polarity within academic disciplines where the precise relationship between the body and its clothing remains unclear.

Entwistle [6] has proposed a framework of theoretical resources for a more holistic analysis of the relationship between body and clothing. She draws primarily on the work of Douglas [7] Foucault [8] and Merleau-Ponty [9] also Goffman [10] and Bourdieu [11] who offer useful insights into the ways that the body is made meaningful by culture and fashion with the presence of two bodies: the physical and the social. The social body constrains the way that the physical body is perceived, and there is a continual exchange of meanings between the two, with each reinforcing the other.
Entwistle emphasises the potential value of the phenomenology of Merleau-Ponty [9] as she argues that the discursive model of the social body developed by Foucault, helps us to understand how bodies are given meaning in particular contexts and brings ways to analyse how the body is talked about, but does not provide an account of the body, clothed or otherwise, as it is lived and experienced by individuals.

This draws attention to the limitations of such semiotic, textualist approaches e.g. [7] [8] and to those of other influential 20th century fashion and cultural theorists e.g. [12-16]. These theorists accounted for the emergence of multiple meanings and ambiguity during the post-modern period. Barnard [14] for example, draws together the work of several authors in consideration of the 'undecidability' of the meaning of stiletto-heeled shoes. He explains that 'the stiletto is constituted intertextually, in that it is the object of medical, moral, fashionable and industrial or technological discourses.' In other words, that the meaning of an object is produced in terms of its relations to other objects and in terms of its place in various texts or discourses. It is noteworthy that the corporeal sensations or personal emotions of actually wearing stilettos are not discussed. Nor is the kinesthetic experience stimulated by the redistribution of the stiletto's wearer's weight; or the attention to self, produced by the personal timpani made by such heels on the floor surface. Barnard does refer to the change of posture created by stilettos, where the chest is thrust higher and the stomach pulled in to create a different female shape, but this effect on the body is acknowledged only from the viewpoint of an observer. There is an all-pervading sense in his explanation, as in much writing about fashion, that both the clothes and the person wearing them can only be discussed from a distance, as though they exist in a book to be 'read' or only to be looked at. Yet, so much of the personal relationship we have to clothing is embodied, sensual and materialised, rather than verbalised.

**A sensual revolution**

In recent years a growing literature has taken up a more phenomenological, sensate, and dynamic view of embodiment. Referencing this "sensual revolution", Howes [17] writes that if "...the mind is necessarily embodied and the senses mindful, then a focus on perceptual life is not a matter of losing our minds but of coming to our senses." Research in the disciplines of gender studies, sociology, material culture and anthropology has combined to reveal that clothing’s sensual material qualities embody conventions about propriety, gender, ways of moving; encode social relationships, status, biographies and identities [18-23]. This work has indicated that as a collection of ideas worn on the body, the intimacy of clothing needs ‘to feel right’ [23].

Within the discipline of cognitive science the emerging viewpoint of ‘embodied cognition’ holds that cognitive processes are deeply rooted in the body’s sensory and motor interactions with the world [24]. Western ontology has tended to privilege the mind and cognition in the constitution of self; but embodied cognition argues that we should look instead for more complex and plural understandings of the nature of selfhood, that encompass embodiment. This shift of emphasis suggests that the nature of our bodies and how they move and function, affects the fundamental processes of our thinking. Indeed, Clark’s [25] description of embodied cognition in terms of how ‘we are mind on the hoof’, seems to have particular resonance for the study of footwear.

Described as a masterpiece of art and engineering by Leonardo Da Vinci, the human foot contains more bones than any other single part of the body. Together with the proprioceptive system, it makes balance and ambulation possible and is central to locomotion and our ability to move in the world. Foot protection was the original role of footwear, but shoes have evolved to become much more than that. Footwear design synthesises personal aesthetics, social propriety, emotion and feeling, along with the proprioceptive functionality of the human body. Clothing involves practical actions directed by the body upon the body, which result in altered or differentiated ways of being and moving. The ways of sitting, standing and walking are varied in respect of the
design of footwear, for example, the differing ways of moving in high heels, trainers or flip flops. “Shoes help transform a woman.”… “You put high heels on and you change” [26]. So as well as objects of ‘fashion’, clothing and footwear need to be understood in terms of the bodies that occupy them and give them life. We cannot understand clothing separately from the meaning and significance of the body, or consider the body without the affecting, socialising, sensual materiality of its clothing [27]. The more sensate and dynamic viewpoint offers richer, and alternative approaches for designers. Footwear in particular, brings unique opportunities for research at the intersection of fashion design and medicine, where mutually limiting attitudes and practices may be identified. It has the potential to blur boundaries between emotional and functional approaches, and to liberate insights with relevance to a range of design and medical situations.

If the shoe fits: RA, footwear and social inclusion

Today fashion is ubiquitous, an inevitable aspect of mass-produced clothing and footwear; experienced via the media, in the retail environment and during social interaction. For many, being perceived by others as fashionable has become an important aspect of personal and social identity; interpreted as signs of keeping ‘up to date’ or of ‘youthfulness’ and active social engagement, and footwear epitomises this. A recent survey reported that 1 in 10 women in UK spend more than £1,000 a year on shoes while 8% of women own more than 100 pairs each [28]. Some of the most expensive and influential footwear ranges are offered by elite brands such as Manolo Blahnik, Jimmy Choo, Christian Louboutin, Salvatore Ferragamo, Louis Vuitton, Prada or Gucci. As a result of advertising design, media placement and widespread recognition of their distinctive, signature aesthetics, these branded accessory products may be perceived as highly desirable, fashion statements in their own right. They represent a potent concoction of high fashion, catwalk glamour, beauty, luxury, sexuality, femininity and high social status.

“Fashion expresses the gender, age, economic strata and social echelon of its wearer. Fashion can facilitate or hinder comfort, health and ease of movement. It reflects cultural ritual, morality and sexual liberation.” [29]

Due to the ‘trickle down’ character of the fashion system, designer styles are extensively copied. Currently, many styles have extremely high heels, so for their wearers, elevation is both physical and cultural. The translation from catwalk to high street provides the opportunity for many more women to access high fashion footwear. However, for some women this opportunity is denied because the principles of fashion shoe design and mass-production are by their nature predicated on ‘normal’ or average foot sizes and shapes. They do not include feet whose dimensions are outside the ‘normal’ foot range - such as those of women with rheumatoid arthritis.

Living with RA: footwear and the wardrobe

RA is not just ‘arthritis’; it is a systemic autoimmune disease in which inflammation attacks many parts of the body with the focus being the joints of the hands and feet. It affects more women than men and approximately 1% of the UK population [30]. As a progressive long-term condition it poses significant challenges to the way people experience, perceive and understand their body. Consequences are constant levels of pain, fatigue, and limitations to movement and dexterity, along with the development of deformities, which create major challenges to finding shoes that fit. For women with RA this challenge often starts with a protracted search of normal high street retailers, specialist retailers on the high street or from mail order catalogues. Despite this footwear being more ‘main-stream’ in its design there is a tension for these women between their desire for aesthetically pleasing footwear and footwear that will accommodate their feet comfortably and safely. When this mission fails, the alternative is to be provided with
specialist ‘therapeutic’ footwear provided to the NHS by orthotic companies (Figure 1). However, it is known that many patients choose not to wear this footwear with them ending up as ‘…shoes in the cupboard’ [31]. Even for those who wear the footwear as it accommodates their feet comfortably, the poor aesthetics of the footwear can be a symbolic marker of disease, disability and of being different to women of the same age. As one of the women in Williams et al [4] study reveals:

“…while wearing this footwear your illness becomes the area for attention… I don’t deny my illness, but I don’t want my illness to become me …it takes a lot of things away from you. To be provided with these shoes was the last step though.”

Yvonne.

Another participant summarised the conflict between achieving comfort and the socially undesirable aesthetics of therapeutic footwear:

“They improve my mobility but restrict my activities…was invited to a wedding…didn’t go…just sat at home and cried.” Daphne [2].

Footwear had such a strong impact on some participants in this study that they felt they could no longer go out and interact socially. Plach et al [32] found that RA patients tended to try to keep their changing appearance hidden, choosing clothes and body positions to cover their arthritic joints. Therapeutic footwear often makes this impossible and Plach suggested that exposure, changes a private body to a public one, leaving sufferers humiliated.

In relation to feet in their unshod state, the women expressed feelings of sadness and loss about how their feet were visibly different from ‘normal’ women, [2] and felt that the therapeutic footwear displayed their difference to others, as expressed by Rose:

“The shoes…. as soon as I see a person I can say oh yes she’s got hospital shoes on… I compare my boots with other people and they are more feminine and pretty and that makes me feel sad.” Rose

The women made attempts to disguise their footwear by wearing trousers rather than skirts or dresses but then this in turn limited their choices of clothing for social occasions and often they chose not to participate because of their experiences of loss of femininity and identity.

These findings were echoed in a related study by Candy and Goodacre [5], which accessed the contents of wardrobes belonging to a group of women living with RA, to examine the relationship between self-image, clothing and social activity. In this study, all of the women had found shoes that met the requirements of middle ground or ‘everyday’ outfits, which tend to be comfortable and serviceable. These shoes had all been purchased from high street sources. For some, this had involved a significant redefinition of their middle ground appearance, for example by adopting casual trousers instead of skirts and dresses. However, when required to dress for a special occasion, or an important professional event, all the women experienced shoe related problems that either excluded them from the looks they connected with femininity, elegance or professionalism, or required them to wear clothes they associated with these identities, but with shoes of a more comfortable and serviceable style. This left them feeling excluded, self-conscious and vulnerable to the critical gaze of others [5].

Women in employment or with more diverse social lives described how shoes significantly limited their clothing choices and ultimately their ability to present themselves in the way they wanted to. Several women spoke of the potential enjoyment of fashion, but how the limitations imposed by shoes excluded them from achieving looks they felt were ‘professional’, ‘smart’, ‘fashionable’; or of feeling connected and part of a group:

“If I’m going out with the girls I might wear my jeans, cowboy boots and a top…because well, I think that’s because that’s what they wear, what my friends wear, so that’s what I wear. Even though they’ve not got RA or any conditions, you tend to want to be like everyone else, even though there are some times when you can’t.”
The research revealed that shoes are fundamental to the workings of the wardrobe: they form the grounding for clothing style and are elemental within the perceived ‘rules’ that govern how clothes can be worn together. One participant spoke about the importance of getting ‘the look’ right:

“I think it just goes together. A dress and a skirt, to me you need to wear heels, or boots with heels to get the whole look.” “…I feel with work if you want to succeed you have to have this image really I suppose…”

Another described how she decides what garments she can wear based on the shoes she is able to put on her feet that day. A participant referenced her embodied experience of shoes to communicate what RA feels like:

“Oh yes, I love shoes … I just like wearin g nice shoes”… “But now I can’t, I’ve got to wear clumpy shoes that won’t press on here and won’t press on your little toe and won’t press on your big toe and the bottom has to be softer because when you are walking, if you haven’t got a bit of sponge underneath your foot, its harsh when you hit the ground so it makes it… to me basically rheumatoid arthritis is not just when your joints go, its every bit of my body is tender, is basically it. So my clothes, my shoes and everything have to be gentle on us, that’s the best way I can describe it.”

Many described having knowingly bought ill-fitting shoes to match an outfit, which illustrates the powerfully affecting qualities of shoes and their ability to define an outfit, and by implication, the person wearing it. Shoes were perceived not only as functional items to protect the feet, but also as objects imbued with potent, socially defined meanings with the potential to compromise dress codes if worn inappropriately [3].

These various research projects identified problems with the appearance of NHS therapeutic footwear. The research also showed that there are significant problems with shoes purchased on the high street in terms of available styles, discomfort and poor fit. Even in the wider population, it is known that poor foot posture can put the whole body out of balance, [33]. In one study 80% of 356 healthy females reported foot pain whilst wearing shoes [34]. This pain can affect an individual’s gait pattern and cause changes to their static posture, and is thought to be greater in females who suffer 9 times more foot pain than males [34].

There is scope for reciprocal understanding between mainstream fashion designers and therapeutic footwear practitioners. To better understand current barriers to this possibility, we will briefly consider the contrasting professional orientations of influential practitioners.

Practitioners: shoe or foot?

Footwear designers undertake a degree or equivalent study in a specific area e.g. footwear, textiles, fashion, or product design. Some gain their footwear design skills at master’s level, or from experience of production. An understanding of the possibilities of materials and manufacturing processes are essential to successful footwear design, along with knowledge of fashion and aesthetics. Designers observe trends as they develop on the catwalk, in social situations or via trend prediction organisations and trade fairs. They use this sense of the market place to produce design concepts that will be both marketable and practical for manufacture. However, they rarely communicate directly with the people who may, or may not purchase and wear their designs. Design directions are most often established via the creation of scenario, styling or mood boards, where shoe aesthetics are expressed via selections of imagery that reference networks of other, related objects – such as clothing and accessories and any other key pointers for design (Figure 2). These are used to communicate and create consensus within design, marketing and production teams in order to resolve products for manufacture and retail.

Orthotists are clinical practitioners and they provide a range of braces, splints and special footwear to assist movement and relieve discomfort for the whole body. A range
of materials and devices are used in such interventions (Figure 3). The majority of orthotists work for the commercial companies that provide a service within hospitals, and they deal with people with a wide range of musculoskeletal conditions. To become a registered practitioner they undertake a degree in orthotics and prosthetics. Despite their medical knowledge and professional aims to improve foot health and hence patients' quality of life, it has been demonstrated that the practitioners’ agenda may not be the same as the patients in relation to therapeutic footwear [2]. Within a clinical context shoes are perceived predominantly as functional artefacts, which protect and support feet and prevent further damage.

"You assume they know their job but we know our bodies don't we ...I know what will work.... and its not just a matter about what will work for our bodies ...it has to feel right... look right and ...well its more about how we feel in the head isn't it?" Carol.

Carol's words describe the complex mix of issues that relate to footwear in general [2], which optimally, must fit the feet but should also fit the persons’ embodied sense of identity. However, it can currently be observed that:

- in the clinical context, the emphasis is on the intervention. There is a striking polarity between functional attitudes towards shoes, and their other more qualitative, social meanings. There is no acknowledgement of the potential of shoes to negatively affect the appearance, experiences, or social inclusion of the patient who has to wear them.
- in the design context there is an emphasis on fashion, aesthetics, manufacture and sales. There is little acknowledgement of the potential of shoes to cause pain, or affect the body in negative ways. Designers rarely commune directly with the users of their work. Success is measured by volume of sales and by correlation with fashion's canon.
- the footwear companies that provide footwear to the NHS do not actively involve the people who are going to wear the footwear in the design process.

Social innovation through inclusive design

Inclusive design methodology attempts to involve all stakeholders in the design process to help ensure that the product or service designed meets their needs and is usable. In
addition, the dynamic set up by engagement in the design process has the potential to reveal similarities and differences in priorities, for instance the personal and social needs of users as well as the methods, language and professional expectations of practitioners. The recent inclusive project “Design for Patient Dignity” by Design Council, and Royal College of Art Helen Hamlyn, explored connections between medicine and design, when working to solve dignity issues related to clothing and the body in a hospital environment, by producing an innovative universal gown. Ben de Lisi the fashion designer responsible for coordinating the design of the new gown, said: “This project isn't about glamour it's about well being. This gown has to be hardworking and user-friendly and help clinicians to do their job — without costing NHS Trusts more money.” [35].

De Lisi consulted around 30 hospital staff and patients. This inspirational clothing project highlights the importance of an inclusive approach to designing for the human body in medical contexts. Garment design must take hygiene into account along with the dimensions and biomechanics of the physical body in order to facilitate necessary access for treatment by healthcare practitioners. It must also be responsive to sensory, social, and emotional understandings of the body that require it to be dressed to avoid accidental exposure, to feel comfortable and protect personal dignity. Design for therapeutic footwear can certainly learn much from the inclusive priorities established by this work. However, there is additional complexity in that therapeutic footwear is a medical intervention that replaces something normally worn at a range of social occasions that take place beyond the hospital environment where a medical aesthetic pervades. In a social environment where fashion is dominant, the appearance of therapeutic footwear can stigmatise wearers, by ‘changing a private body to a public one’ [32], leaving wearers feeling humiliated and excluded.

Studies of inclusive design have shown that while many companies agree with the principles of designing inclusively, they also consider it impractical for them to adopt such practices. The reasons that are commonly cited include [36]:

- Insufficient financial resources/time
- Inadequate access to product users
- Inexperience in dealing directly with users
- A lack of demand from commissioners of the designs.

The 2000 Audit Commission [37] review of NHS therapeutic footwear stated: “clinicians utilise this footwear with an associated expenditure of approximately £20 million per year.” Bowker et al [38] suggested that one in 6 pairs were not being worn, but admitted that this was likely to be a gross underestimation due to the fact that there was little monitoring or evaluation of outcomes. Therefore it can be calculated that approximately £3½ million is wasted annually. This suggests that there is every reason to implement inclusive design methodologies to bring about social innovation in this sphere.

In July 2010 a ‘Footwear ‘Design Challenge’ underpinned by the research referenced in this paper and funded by Arthritis Research UK, took place over two days in the School of Art Design and Performance at UCLAN, in conjunction with the Royal College of Art Helen Hamlyn. This workshop convened three teams, each made up of designers, clinicians and a woman living with RA, in order to brainstorm breakthrough concepts for footwear. Their brief was to design an innovative ‘social occasion’ shoe for women, which could have wide appeal.

The footwear workshop formed an innovative exploratory work to examine how conflicting approaches in the fields of fashion footwear and therapeutic footwear may achieve collaborative synthesis. As well as providing a valuable arena for the exchange of expertise, the focus of the event allowed all participants to reflect on the complexity the socio-cultural dilemma of comfort versus style within footwear design and provision. Innovative, hybrid pedagogical approaches were discussed along with revisions to practitioner/patient interactions and shoe wearers in general. Several original shoe design concepts were developed, which integrated for example: modular forms and components, additional capacity for orthotic elements and shock absorption,
experimental use of materials and construction for ease of putting on and removing, fastening mechanisms, heel adaptations, decorative and visual styling concepts. We look forward to reporting in more detail in forthcoming publications.

Conclusions
Therapeutic shoes are medical devices that replace personally and socially communicative, fashion adornment. So, unlike any other medical intervention, this footwear replaces something that is normally worn as an aspect of an individual's identity. It may be experienced as a marker of disease and invade the lives of women, interfering with their identity. In both fashion and health contexts, footwear is viewed differently by clinical practitioners, footwear designers, and the women who wear it.

The sensate and dynamic view of the clothed body brings richer and alternative ways of understanding the sensory experiences of users. Shoes are highly specialised, culturally complex artifacts that protect, augment and adorn not only the foot, but the entire human body. Research has shown that shoes can profoundly affect both the appearance and the lived experience of the person wearing them.

An initial inclusive design workshop has been extremely encouraging as an exploratory work to examine how conflicting approaches may be brought together to create collaborative synthesis. Re-orientation in both the ‘patient'/health practitioner and the ‘user'/design practitioner relationships, together with reciprocal understanding and innovation, will begin to bridge the divide between the functional understandings held in medicine and the social expressions of fashion.

Social innovation cannot be achieved by the wave of a fairy godmother’s magic wand. Inclusive and participatory design approaches to the ‘whole person’ have the potential to blur the false boundaries between emotion and function that engender social exclusion, by stimulating the design and provision of footwear that looks right and feels right, for all who wear it.

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