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## A sense of space: the separation of dress and body in microgravity

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### ABSTRACT

In microgravity, the astronaut's body is suspended in a void, separated from its surroundings except where measures have been taken to tether it to a surface. The experience of weightlessness can be characterised as ungroundedness – the feeling of being out of touch with surrounding surfaces. This sensation extends to clothing, which is suspended in the space around the body, not anchored to the skin as it is in normogravity. While on Earth, the weight of clothing on skin is a constant reminder of gravitational forces, equally, in space, the absence of the sensation of cloth against skin is a reminder that the body is located in an extra-terrestrial environment in which the behaviours and sensations of everyday objects are defamiliarized. This article briefly considers the sensation of weightlessness from the perspective of the relationship between clothes and the body, and proposes ways in which these considerations could inform creative practice in fashion and costume design, and in depictions of the clothed, weightless body.

### KEYWORDS

Weightlessness; space; touch; design; fashion

### Introduction

In microgravity, the astronaut's body is suspended in a void, separated from its surroundings except where measures have been taken to tether it to a surface. The experience of weightlessness can be characterized as ungroundedness – the feeling of being out of touch with surrounding surfaces. This sensation extends to clothing, which is suspended in the space around the body, not anchored to the skin as it is in normogravity. While on Earth, the weight of clothing on skin is a constant reminder of gravitational forces, equally, in space, the absence of the sensation of cloth against skin is a reminder that the body is located in an extra-terrestrial environment. When designing or depicting clothes for future space travelers, it is helpful to consider weightlessness from the perspective of the relationship between clothes and the body.

### Gravity and the dressed body

Clothes are a constant reminder of gravitational force. In Earth gravity (normogravity), just as gravity attracts the body to the ground, it attracts clothes to the body. The weight of a garment, as experienced when that garment rests upon a body, is the pull of the Earth,

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attracting the garment toward its core. These sensations change as the body moves, as limbs change their orientation relative to the direction of gravitation, and clothes shift against the skin. By experiencing the dynamic touch of a garment against skin, we have “haptic knowledge” of the clothes that rest upon our bodies (Stanes 2019, 229). Daniel Miller (2009, 24) observes that the haptic experience of clothes is not just broadly familiar but, more specifically, provides reassurance that a garment is correctly draped or secured on the body.

The sensation of cloth against skin is one that is taken for granted in our understanding of clothes as a second skin or extension of the body. As Joanne Entwistle (2002) tells us, “dress has an intimate relationship with the body . . . It lies on the boundary between self and other.” This intimacy is caused by the “close proximity [of clothes] to the flesh,” a proximity that is experienced visually and tactilely, and shaped by gravity. In the field of fashion design the effects of gravity are similarly taken for granted. Erin Cadigan (2014, 125) presents drape and structure in direct opposition, as either falling or resisting gravity. A fashion designer’s goal, she argues, should be to pursue a “balance between drape and structure.” This balance is not achieved only in the choice of textile, but also in the construction of the garment, which may be shaped so as to “fight . . . gravity.”

### Dress in the void

Alternative gravity conditions result in new bodily experiences. The microgravity that is experienced during spaceflight or on board the International Space Station (ISS) causes the body to be weightless, and to become separated from surrounding objects and surfaces. This has implications for the relationship between clothes and the body. Annick Bureaud (2009) posits that “weightlessness is inscribed in the limits of the self and the human body,” and if the external limits of the body are unclear, then so too is the division between body and clothes. In this environment, the act of wearing is not a matter of swathing the body in cloth but, rather, blurring the divide between body and space.

In the weightless environment, clothing billows around the wearer, surrounding the body but not suspended from it. Astronaut Scott Kelly reports that, on board the International Space Station, “skin comes into contact with other surfaces much less frequently than it would on Earth” (Harrington 2016). Indeed, the lack of contact with clothing is such a common part of the spaceflight experience that astronauts become accustomed to living without the weight of clothes against their skin, to the extent that some report physical discomfort from contact with everyday clothing after returning to Earth (Dunn 2016; Harrington 2016).

This visible effects of microgravity can be seen in images recorded on board the ISS, where astronauts’ clothes can be seen billowing away from their torsos, lifting at the collar, and forming contours that do not trace those of the human body within (see [Figure 1](#)). NASA astronauts’ routine wear, including commercially available sweatshirts and polo shirts, and specialist flight suits, exhibit these effects to a greater or lesser degree depending on their fit and elasticity. Where a garment is close-fitting it forms a second skin, and is carried along with the body’s movements; where the cloth is loose-fitting, it does not drape, but rather, extends outwards, out of contact with the skin, taking shape independently of the body.

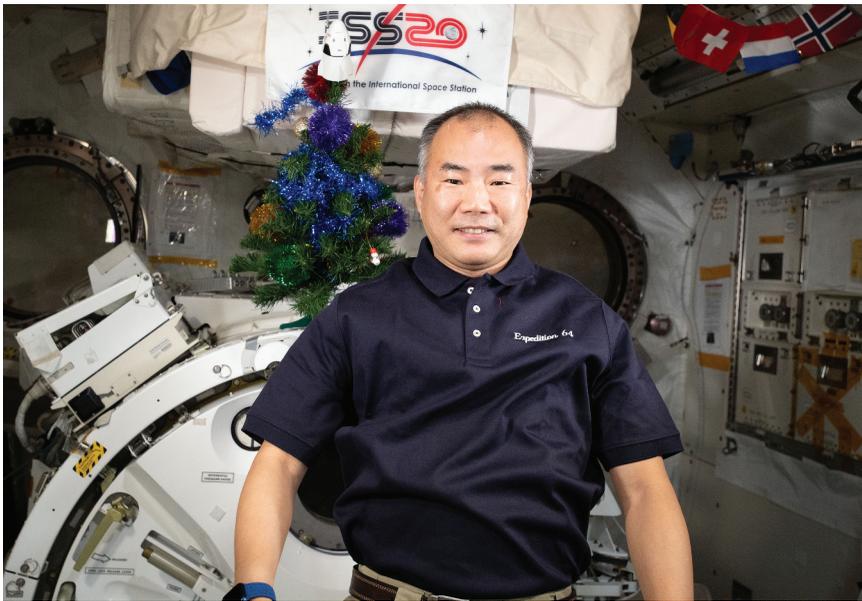


**Figure 1.** Astronauts Andrew Morgan and Luca Parmitano dressed in hooded sweatshirts in the microgravity environment of the International Space Station. Due to weightlessness the sweatshirts billow away from the body, with hoods rising upwards towards the wearers' heads, and fabric distorting at the chest where it is out of contact with the body. NASA, 2019.

On Earth, where we consider clothes in reference to the body, we might imagine clothes in two main states – worn and unworn – where they are draped upon and shaped by the body, or else, when unworn, crumpled, limp, and “lack[ing] fullness” (Entwistle 2002, 137). In microgravity we encounter a third state for clothes, in which they appear to have form and fullness, but adopt contours that are uncannily otherworldly. There is an impression of intermittent collision between garment and body, as if clothes are partly worn and partly unworn (see Figure 2). Here, cloth is not a second skin that is swept along with the motions of the body, rather, it is an independent form that is interrupted by the body.

### Implications for creative practice

Recent commercial spaceflight activity evidences the increasing feasibility of mass space tourism. Private spaceflights by Virgin Galactic and Blue Origin have carried private passengers, including founders Richard Branson and Jeff Bezos respectively, to the edge of space, where they encountered periods of weightlessness. These flights pave the way for further and more frequent space tourism activities (Murnaghan 2021). At the same time, there is an increase in the viability of space as a site for creative practice (Thorpe 2009, 27), with both Russian and American film production agencies currently planning production on board the International Space Station (Shoard 2021). Clothing has necessarily been a consideration for these activities, and the demand for a wider variety of spacewear will inevitably follow an increase in the variety of activities that take place within microgravity.



**Figure 2.** JAXA astronaut Soichi Noguchi wears a polo shirt on board the International Space Station. Waves and folds can be seen where the fabric might normally be expected to drape against the torso. Additional volume appears to exist between the shoulders and neck where the collar rises upwards, with an effect of appearing to flatten the curve of the shoulders. In these ways, the silhouette of the shirt does not conform to the contours of the body. NASA, 2020.

Spacewear design has so far tended to follow the example of functional garments worn by professional astronauts. A common approach to spacewear design is demonstrated in the flight suits designed for Virgin Galactic by clothing brand Under Armour (2019), with form-fitting garments that continue a tradition of close-fitting flight suits established in the Jet Age. If the designer's aim is to maintain close contact between the body and a garment, throughout the whole garment, then this approach is appropriate and well-established. However, this approach minimizes the tactile and visual evidence of weightlessness, by limiting the potential for separation of cloth from skin. It is reasonable to assume that space tourists will one day want to use spacewear for personal expression, just as they do on Earth. Overly functional and form-fitting designs neglect the potential for spacewear to have esthetic or expressive purposes.

One of the pleasures of weightlessness is defamiliarization. Cosmonaut Valentin Lebedev describes living in a near-constant state of awe during his time aboard the ISS as every familiar experience was made strange (Battaglia 2012, 1091–93). It is important for future spacewear designers to consider the potential to exploit the effects of weightlessness for creative effect, and to maximize the otherworldly experience of space travel through defamiliarization of dress. If the haptic sensation of dress is one of the everyday experiences that characterizes life on Earth, then design that exploits the separation of clothes and body may be one way in which designers can heighten the pleasure of weightlessness.

For Earth-bound audiences who consume images of spaceflight, the effects of weightlessness will need to be communicated visually to Earthbound audiences. Adriano D'Aloia (2012, 233) explores how "intangibility is a constitutive element of representation [in

space films],” contributing to an audience’s sensorial immersion, and a sense of suspension in the void of space. It should be possible to heighten immersion by exploiting what Joanna Scholefield (2014) identifies as a “haptic and intuitive association between the skin of the subject [on-screen] and our own skin” by considering how weightlessness effects the haptic sensation of dress. The separation of clothes and body is one of the primary visible indicators that the dressed body is weightless, and therefore, there are opportunities for fashion and costume designers to creatively engage with the separation of cloth from skin when designing for microgravity.

More broadly, designers need to reflect on the extent that they take for granted the notion of clothing as a second skin. Harriet Parry (2017) tells us that “cloth . . . is always in contact with, or imagined to be in contact with, the skin, our largest sense organ.” To design clothes for a spacefaring future, designers need to move beyond that mind-set, or else adjust it to imagine different kinds of contact between the body and the garments that it inhabits.

### Disclosure statement

No potential conflict of interest was reported by the author(s).

### Notes on contributor

**Barbara Brownie** is Associate Dean (AQ) of the School of Creative Arts at the University of Hertfordshire. Her research focuses on the relationship between clothes and the body. Her most recent book is *Spacewear: Weightlessness and the final frontier of fashion* (Bloomsbury 2019).

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